For Committee Use

WORKING MATERIALS

ANIMAL AND ANIMAL PRODUCTS RESEARCH ADVISORY COMMITTEE

Washington, D. C. April 1-5, 1968

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FUNCTIONS AND RESPONSIBILITIES OF ADVISORY COMMITTEES

The Agricultural Economics Research Advisory Committee is one of several commodity and functional committees established pursuant to Title III of the Research and Marketing Act of 1946. Functions of these committees include:

1. Identifying and appraising opportunities for research progress, including the development of new knowledge and the solution of problems and needs of producers, processors, distributors, and consumers.

2. Reviewing and evaluating current agricultural research programs.

3. Recommending adjustments, where appropriate, in research programs. This may be accomplished through termination, redirection, expansion, or initiation.

4. Developing a better understanding of the nature and value of the agricultural research programs, explaining them to interested persons, groups, and organizations, and encouraging wider and more rapid application of research findings.

The committees perform an important function in advising with respect to the development of the research programs. Their recommendations assist research administrators in formulating budgets and administering these programs.

CRITERIA FOR EVALUATION OF RESEARCH

Criteria useful in evaluating research programs include:

1. Extent to which the research meets local, regional, and national goals.

2. Scope of problem considering area, people, and units affected.

3. Benefits of research findings in relation to costs.

4. Urgency of need.

5. Contribution to knowledge.

6. Feasibility of implementation and likelihood of a successful completion in a reasonable period of time.

7. Likelihood that research results will not be available elsewhere.

8. Likelihood of extensive and immediate adoption of results.

NATIONAL AGRICULTURAL RESEARCH ADVISORY COMMITTEES

Agriculture-Wide

ARPC - Agricultural Research Planning Committee
CAS - Committee on Agricultural Science
CON - Committee of Nine (Cooperative Regional Research)
NARAC - National Agricultural Research Advisory Committee

Committee and Functional

Research and Marketing Act

EC - Agricultural Economics Research Advisory Committee
AAP - Animal and Animal Products Research Advisory Committee
CO - Cotton Research Advisory Committee
FRF - Farm Resources and Facilities Research Advisory Committee
FO - Forestry Research Advisory Committee
GF - Grain and Forage Crops Research Advisory Committee
HC - Horticultural Crops Research Advisory Committee
NCU - Human Nutrition and Consumer Use Research Advisory Committee
MR - Marketing Research Advisory Committee
OP - Oilseed and Peanut Crops Research Advisory Committee
PSE - Plant Science and Entomology Research Advisory Committee
SU - Sugar Crops Research Advisory Committee
TO - Tobacco Research Advisory Committee
URD - Utilization Research and Development Advisory Committee

McIntire-Stennis Act

CFO - Cooperative Forestry Research Advisory Committee

SCIENTIST MAN-YEAR

A scientist man-year (SMY) is defined as the equivalent of one year's time of a research scientist who is professionally trained and bears responsibility for planning and carrying out research. This generally includes all employees of grade GS-11 and above whose positions are classified in a professional scientific series.

The amount of support (resources and staff) associated with a SMY varies depending upon the nature of the research undertaken.

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Executive Secretary: Max Hinds, Research Program Development and Evaluation Staff

UNITED STATES DEPARTMENT OF AGRICULTURE
Washington, D. C. 20250

BIOGRAPHICAL SKETCHES

Members of

ANIMAL AND ANIMAL PRODUCTS RESEARCH ADVISORY COMMITTEE

Craig Beane, Fort Atkinson, Wisconsin, owns and operates Holwis Farm where he maintains a registered herd of 100 Holstein-Friesian cows. He has been in the dairy business for twenty years and recently expanded his herd into a joint operation with his son. He attended Blackburn College at Carlinville, Illinois, for a year prior to enlisting in the Marine Corps during World War II. He began his farming career following military service. He is currently president of the National Dairy Herd Improvement Assn., Inc. He has served as both local and state Dairy Herd Improvement Assn. director. He is vice president of Agricultural Records Cooperative in Madison, Wisconsin; a director of the Milwaukee Milk Producers Assn.; and a board member of the Milwaukee Dairy Council. In 1965 he received an award from a Madison, Wisconsin, radio station as the outstanding dairy farmer in the listening area. He and his wife have been leaders for their local 4-H Club.

Joseph V. Cunningham, York, Nebraska, is past president of the Nebraska-Iowa Milk Producers Assn. While president he also served as a member of the Board of Directors of the Central Southwest Dairy Cooperative which has a plant in Albuquerque, New Mexico. He operates a Grade A dairy farm and 480 acres of irrigated farmland. Also, he has a general real estate business and home building operation in the city of York. He serves as director of dairy councils in both Lincoln and Omaha and as director of the Nebraska branch of the American Dairy Assn., as chairman of the York Planning Commission, and chairman of the York Civil Service Commission. He attended York College for a business course.

Otis G. Esham, Parsonburg, Maryland, has a continuous research program using about 98,000 broilers to test breeding and feeding. He also operates a broiler chick hatchery, a broiler-fryer operation, feed mill, and recently a poultry processing plant. He has an honorary degree for outstanding ability in agriculture from the University of Maryland and in 1952-53 the Delmarva poultry industry honored him with a "Distinguished Citizen Award." During 1965 he served as vice president of the National Broiler Council and currently is a member of its Board of Directors.

Dr. Edward B. Evans, Prairie View, Texas, is president emeritus of Prairie View Agricultural and Mechanical College. He established the Department of Veterinary Science at the above college in 1918 and the Veterinary Hospital Clinic in 1924. He received his D.V.M. at Iowa State University. He served in World War I. In 1953 he received the Southside Award for Man-of-the-Year in service to agriculture and the Hoblitzelle Achievement Award. He has been recognized for more than twenty-five years of continuous service to the Texas A&M College system. In addition, he is active in a number of local, state, and national organizations. He previously was a member of the Dairy Research and Marketing Advisory Committee.

Dr. Aaron H. Groth, Columbia, Missouri, is dean emeritus of the School of Veterinary Medicine at the University of Missouri. He graduated from Iowa State University, went to Colorado A&M College for his M.S. degree and returned to Iowa State for the D.V.M. degree. Early in his career he served as field representative for a beef producers association, then on the faculty of Texas A&M, Colorado A&M, and Louisiana State University. In addition, his experience includes service on the Minnesota Livestock Sanitary Board and director of the USDA Regional Animal Disease Laboratory at Auburn, Alabama. He was previously a member of the Livestock Research and Marketing Advisory Committee.

Burdet Heinemann, Springfield, Missouri, is vice president for research and product development, Producers Creamery Company, a dairy cooperative. He started work for this firm in 1936 and has been responsible for a number of innovations in the field of new dairy products which his company has developed, of which Metrecal was most notable. He represented his company in the recent joint government-industry pilot plant research program for developing commercial feasibility of removing strontium 90 from milk in case of a national emergency. He received a B.S. degree from Iowa State in 1937. He served on a number of dairy industry committees including the Dry Milk Institute and the National Research Council. Also, he is a member of the American Chemical Society, the Society of Microbiologists, the American Dairy Science Assn., the Public Health Assn., and the Institute of Food Technology.

Philip I. Higley, De Forest, Wisconsin, is president of American Breeders Service, Inc., and was general manager of its predecessor organizations since 1941. This organization employs 1,200 inseminators and provides service in all fifty states and some foreign countries. His experience includes that of county agricultural agent. He has participated in the activities of the National Assn. of Artificial Breeders and the American Dairy Science Assn. He graduated from Cornell University.

George K. Hislop, Spokane, Washington, is owner of Hislop and Son and president of the Hislop Sheep Company. They have 5,000 ewes lambing each year and feed out 15,000 to 20,000 feeder-lambs annually. He is past president of the Washington Wool Growers Assn. and currently is chairman of its Lamb Promotion Committee. Also, he is past president of the National Wool Growers Assn. and past chairman of the Lamb Subcommittee of the Industrywide Lamb and Wool Planning Committee of the National Wool Growers Assn. He holds a B.A. degree in political science and foreign relations from Stanford University. He served on the National Advisory Commission on Food and Fiber from 1965 to 1967.

Dr. Earl L. Lasley, Hampton, Iowa, is a director of the Farmers Hybrid Companies, Inc., and has full responsibility for breeding and seed stock production of corn, swine, and beef cattle. The company operates a medium-sized farm which produces and sells to commercial hog farmers over 5,000 boars each year. He received his B.S. and M.S. degrees from the North Dakota State University and his doctorate at Iowa State University. He has been a teacher and researcher in animal husbandry at three midwestern universities -- North Dakota, Iowa, and Illinois. He has published a number of scientific papers on swine breeding and genetics. He is an active participant in improvement programs for the swine industry and has contact with breeders, producers, and professional groups. He averages about thirty speaking engagements a year to farmer groups and associations. He is an active member of the American Society of Animal Science, American Society of Agronomy, and the Genetic Society of America. He is currently a member of the Hamption, Iowa, Board of Education.

Hyman F. McCarty, Jr., Magee, Mississippi, has an integrated broiler operation which includes pullet growing, breeder hens, broiler production, hatcheries and feed mill. He has been active in a number of state and national poultry and egg associations and is past president of the Southeastern Poultry and Egg Assn. and is a director in both the National Broiler Council and the Mississippi Grain and Feed Dealers Assn. His academic training was in history and prelaw; he holds a B.A. from the University of Mississippi and an M.A. from the University of South Carolina.

Charles M. Quarre', Bakersfield, California, is manager of the Cattle Division, Kern County Land Co. He was graduated from the University of California at Davis with a major in animal husbandry. In 1962 he participated in the Stanford University Executive Development Program. His early experience includes that of foreman of a diversified ranching operation. In 1951 he became associated with the Kern County Land Co. and since then has held virtually every position in the Cattle Division including that of cowboy, statistician, animal nutritionist, administrative assistant, general superintendent, and assistant division manager. In 1957 he became Cattle Division manager. Other activities include: chairman of the Research Committee for the American National Cattlemen's Assn., director of the California Cattle Feeders Assn., member of the Advisory Board of the California Beef Council; and is active in other professional and civic groups. In 1966 he served on the Livestock and Poultry Research Panel of the Joint USDA-SAES Long-Range Study. He is presently serving on a Joint USDA-SAES Task Force on Beef Research.

Alan Barde Rogers, Oak Brook, Illinois, is assistant manager of the Food Research Division of Armour and Co. Also at the present time, he is director of the Institute of American Poultry Industries' Research Council which is comprised of fifty-four persons from a cross section of the poultry industry. This council develops an annual set of recommendations for research needs of the poultry industry. He received a B.Sc. degree at Iowa State and took additional graduate work. Prior to his present position, his experience at Armour and Co. includes work as research chemist, chemical process development, chemical market development, and head of dairy, poultry, and specialty products. He developed a system of pasteurizing egg products and the company's magic sliced turkey roast. His special fields have been frozen, prepared foods, and dehydrated foods. He served in the U. S. Navy Reserve during World War II and holds membership in the Chemical Society, Poultry Science Assn., Institute of Food Technicians, and the Institute of American Poultry Industries.

Mylan E. Ross, Chicago, Illinois, is executive vice president and general manager of the National Live Stock Producers Assn. This association serves about twenty member cooperative marketing agencies at terminal markets. He is past director of research for the organization and prior to that was general manager of the National Food Co., director of marketing research of the Pillsbury Co., and senior analyst in marketing research of Armour and Co. Also, he is a member of the Board of Trustees of the American Institute of Cooperation and belongs to the American Marketing Assn. He holds a B.S. degree from the University of Nebraska with majors in economics and animal husbandry, an M.S. degree in business administration from the University of Chicago and continued on toward a Ph.D. In 1966 he served on the Livestock and Poultry Research Panel of the Joint USDA-SAES Long-Range Study.

Dr. Samuel F. Scheidy, Philadelphia, Pennsylvania, is veterinary medical director for Smith Kline and French Laboratories. His experience includes that of field veterinarian for Hershey Creamery and later Abbotts Dairies, research and teaching positions at the School of Veterinary Medicine at the University of Pennsylvania, and veterinary medical dicector of the Medical Division of Sharp and Dohme in 1943. He is a member of state and national veterinary and medical associations and has held top level positions in them. He was graduated from the School of Veterinary Medicine of the University of Pennsylvania. During 1965 he was one of thirty veterinarians on a "People to People" mission to Sweden, Denmark, Germany, Czechoslovakia, and Poland. During 1967 he participated in three international congresses and received the American Veterinary Medical Assn. Award for his outstanding contributions to the advancement of veterinary medicine through organizational aspects. He served as president of the American Veterinary Medical Assn. in 1959-60 and has been a key member of the Executive Board and Board of Trustees for a number of years.

John E. Thompson, Chicago, Illinois, is president-general manager of the Reliable Packing Co. and several subsidiaries. An ancillary feeding operation of up to 8,000 hogs and 1,500 cattle is carried on in Illinois, supported by crop production from some 3,000 acres. In addition, he is president of Thompson Farms in Florida comprising 8,000 acres devoted to cattle ranching and forage development. He holds several patents in the field of food technology and agriculture and has been a member or chairman of committees of a number of state and national associations. He received his B.A. and M.B.A. in business administration from the University of Chicago, an M.S. in foods and nutrition at the Illinois Institute of Technology, and has continued work in physiology, biochemistry, and statistics toward a Ph.D. Previously, he completed two years of medical school in anatomy and pathology. He and his associates have founded Thompson Research Foundation, a nonprofit research organization to study the production of animals for medical research. In 1966 he served on the Livestock and Poultry Research Panel of the Joint USDA-SAES Long-Range Study.

PERSONNEL

The following persons have an interest and/or responsibility for some aspect of research pertaining to livestock and may work with the committee at some time during the meeting. Their working titles are shown to help identify their responsibility within the administrative organization.

George L. Mehren, Assistant Secretary for Marketing and Consumer Services, and Director for Science and Education - CHAIRMAN
Ned D. Bayley, Deputy Director for Science and Education
Edwin R. Goode, Jr., Assistant Deputy Administrator for Farm Research, Agricultural Research Service - VICE CHAIRMAN
Russell C. McGregor, Budget Examiner, Natural Resources Programs Division, U. S. Bureau of the Budget
Max Hinds, Research Program Development and Evaluation Staff, EXECUTIVE SECRETARY

/ Research Program Development and Evaluation Staff /

W. D. Maclay, Director
W. C. Dachtler, Head, Research Advisory Committee Staff

/ Agricultural Research Service /

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R. J. Anderson, Associate Administrator
T. W. Edminster, Deputy Administrator for Farm Research
Earl Glover, Deputy Administrator for Marketing Research
F. J. Mulhern, Deputy Administrator for Regulatory and Control
F. R. Senti, Deputy Administrator for Nutrition, Consumer Use and Industrial Research
Ruth M. Leverton, Assistant Deputy Administrator, NCUIR
S. R. Hoover, Assistant Deputy Administrator, NCUIR
Katherine E. Cronister, Assistant to Deputy Administrator, NCUIR

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W. M. Carleton, Director
R. G. Yeck, Chief, Livestock Engineering & Farm Structures Research Branch
T. E. Hienton, Chief, Farm Electrification Research Branch

Animal Husbandry Research Division

R. E. Hodgson, Director
S. C. King, Assistant Director
E. L. Corley, Assistant Director
E. J. Warwick, Chief, Beef Cattle Research Branch
J. H. Book, Acting Chief, Dairy Cattle Research Branch
C. W. Hess, Chief, Poultry Research Branch
C. E. Terrill, Chief, Sheep and Fur Animals Research Branch
R. J. Gerrits, Chief, Swine Research Branch
R. L. Hiner, Chief, Meat Quality Laboratory

Animal Disease and Parasite Research Division

P. D. DeLay, Director
R. C. Fish, Associate Director
O. L. Osteen, Associate Director
A. O. Foster, Director, Parasitological Laboratory
P. A. O'Berry, Assistant to the Director for Cattle
E. Gill, Assistant to the Director for Poultry
C. M. Thompson, Assistant to the Director for Sheep, Goats & Fur Animals
_____, Assistant to the Director for Swine

Consumer and Food Economics Research Division

Faith Clark, Director
Florence H. Forziati, Assistant Director
Irene M. Wolgamot, Assistant to Director
_____, Chief, Diet Appraisal Branch
Sadye F. Adelson, Chief, Food Consumption Branch

Eastern Utilization Research and Development Division

P. A. Wells, Director - Laboratory at Wyndmoor, Pennsylvania
W. P. Ratchford, Assistant Director
W. I. Patterson, Assistant Director, Washington, D. C.
B. H. Webb, Chief, Dairy Products Laboratory, Washington, D. C.
W. L. Sulzbacher, Chief, Meat Laboratory, Beltsville, Maryland
A. N. Wrigley, Acting Chief, Animal Fat Products Laboratory, Wyndmoor, Pennsylvania
L. P. Witnauer, Chief, Animal Fat Properties Lab., Wyndmoor, Pa.
J. Naghski, Chief, Hides & Leather Laboratory, Wyndmoor, Pa.
G. C. Nutting, Chief, Milk Properties Laboratory, Wyndmoor, Pa.

Entomology Research Division

E. F. Knipling, Director
C. H. Schmidt, Chief, Insects Affecting Man & Animals Research Branch

Human Nutrition Research Division

W. A. Gortner, Director
C. Edith Weir, Assistant Director
Mildred Adams, Chief, Experimental Nutrition Laboratory
E. W. Toepfer, Chief, Food Composition Laboratory
I. Hornstein, Chief, Food Quality and Use Laboratory
W. A. Gortner, Acting Chief, Food Metabolism Laboratory

Market Quality Research Division

H. T. Cook, Director
C. Golumbic, Deputy Director
L. S. Henderson, Chief, Stored Products Insects Research Branch
L. Feinstein, Chief, Field Crops & Animal Products Branch
A. J. Mercuri, Leader, Poultry Quality Investigations
W. A. Moats, Leader, Dairy Quality Investigations
A. W. Kotula, Leader, Meat and Carcass Quality Investigations

Transportation and Facilities Research Division

W. C. Crow, Director
R. W. Hoecker, Chief, Wholesaling and Retailing Research Branch
W. H. Elliott, Chief, Handling & Facilities Research Branch
K. H. Brasfield, Chief, Marketing Facilities Research Branch
J. E. Clayton, Transportation Research Branch
J. A. Hamann, Investigations Leader, Poultry
T. F. Webb, Investigations Leader, Dairy and Livestock

Western Utilization Research and Development Division

M. J. Copley, Director, Laboratory at Albany, California
R. L. Olson, Assistant Director
H. Lineweaver, Chief, Poultry Laboratory
H. Lundgren, Chief, Wool and Mohair Laboratory

/ Farmer Cooperative Service /

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Cooperative Marketing and Farm Supplies

J. K. Samuels, Assistant Administrator
S. F. Krause, Director, Animal & Animal Products Division
R. Fox, Chief Specialist, Livestock and Wool
G. Tucker, Dairy
W. Ullman, Poultry

/ Economic Research Service /

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L. E. Juers, Deputy Administrator, Program Policy
C. F. Heisig, Deputy Administrator, Program Management
Trienah Meyers, Staff Assistant

Economic and Statistical Analysis Division

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W. M. Simmons, Chief, Commodity Analysis Branch
R. Rizek, Assistant Chief, Commodity Analysis Branch
A. G. Mathis, Head, Dairy Section
D. Seaborg, Acting Head, Livestock Section
O. C. Hester, Acting Head, Poultry Section

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K. R. Farrell, Director
W. S. Hoofnagle, Deputy Director
W. T. Manley, Deputy Director
A. C. Manchester, Chief, Animal Products Branch
G. B. Rogers, Leader, Poultry Group
R. J. Crom, Leader, Livestock Group
A. C. Manchester, Acting Leader, Dairy Group

/ Statistical Reporting Service /

Office of the Administrator

H. C. Trelogan, Administrator

Agricultural Estimates Division

R. K. Smith, Director
E. B. Hannawald, Chief, Livestock, Dairy & Poultry Statistics Branch

Standards and Research Division

E. E. Houseman, Director
M. H. Weidenhamer, Chief, Special Surveys Branch

SUMMARY OF SCIENTIST MAN-YEARS - USDA

Division and Activity	F. Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
/ Agricultural Research Service /				
Animal Husbandry Research Division				
Range management				
Control of diseases of livestock and poultry	13.7	1.5	+ 0.9	- 0.3
Control of internal parasites of livestock and poultry	0.1			
Protect livestock and poultry from toxic chemicals, poisonous plants and other hazards	1.3		- 0.5	
Protection of plants and animals from harmful effects of air pollution			+ 0.8	
Reproductive performance of livestock and poultry	18.4	0.5	+ 2.8	- 0.2
Feed efficiency in production of meat, milk, and eggs	25.2	2.3	- 3.0	- 0.6
Environmental stress in production of livestock and poultry	4.5	0.5	- 0.6	
Improve livestock and production management systems	29.2	1.8	+ 1.2	- 0.1
Production of animals and animal products with improved consumer acceptability	6.9	0.2	- 2.2	
Insure food products free from toxic residues from agricultural sources	14.0	2.4	+ 2.0	- 0.6
Alleviate soil, water and pollution		0.1	+ 0.5	
Subtotals	113.3	9.3	+ 1.9	- 1.8
Livestock Engineering Research Division				
Livestock engineering	19.1	0.5	+ 1.8	+ 1.1
Animal Disease & Parasite Research Division				
Infectious & noninfectious diseases of cattle	20.7	3.2		- 0.5
Infectious & noninfectious diseases of swine	10.0	0.9	+ 1.6	+ 0.4
Infectious & noninfectious diseases of sheep and goats	8.6	0.2	- 0.3	
Diseases & parasites of horses	3.8	1.6		
Infectious & noninfectious diseases of poultry	11.5	6.6		- 1.7
Infectious & noninfectious diseases of fur animals	3.0	1.5		- 0.7
Miscellaneous infectious and noninfectious diseases of animals	39.7		+ 2.7	
Foot-and-mouth and other exotic infectious diseases of cattle	24.8		+ 2.4	

SUMMARY OF SCIENTIST MAN-YEARS -- USDA (Cont.)

Division and Activity	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Animal Disease & Parasite Research Division (Cont.)				
Foot-and-mouth & other exotic diseases of swine	6.0		+ 1.4	
Foot-and-mouth & other exotic diseases of sheep	0.6			
Parasites & parasitic diseases of cattle	12.0	0.2	- 0.3	- 0.1
Parasites & parasitic diseases of swine	2.5	0.2	+ 2.5	
Parasites & parasitic diseases of sheep and goats	6.5	0.2	+ 0.1	- 0.1
Parasites & parasitic diseases of poultry	1.6	0.3		
Treatment for removal of parasites	4.4			
Miscellaneous parasites & parasitic diseases	16.4			
Subtotals	172.1	14.9	+ 1.01	- 2.7
Entomology Research Division				
Livestock insects and other arthropods	31.3	4.6	+ 1.0	+ 0.8
Consumer & Food Economics Research Division and Human Nutrition Research Division				
Human nutrition and consumer use	11.2			+ 3.7
Eastern Utilization Research and Development Division				
Dairy utilization - food	55.3	6.6		
Meat utilization - food	19.2	6.8		
Animal fat utilization	34.3	4.8		
Hides & leather utilization	25.1	2.1		
Subtotals	133.9	20.3		
Western Utilization Research and Development Division				
Poultry and egg utilization	19.6	3.2		
Wool utilization	24.4	2.0		
Subtotals	44.0	5.2		
Market Quality Research Division				
Market quality - animal products	10.0	4.7	+ 1.0	+ 2.5
Stored-product insects	2.0	1.4		- 0.7
Subtotals	12.0	6.1	+ 1.0	+ 1.8

SUMMARY OF SCIENTIST MAN-YEARS -- USDA (Cont.)

Division and Activity	F.Y. 1967 Base: Intra-mural	F.Y. 1967 Base: Extra-mural	Changes in F.Y. 1968: Intra-mural	Changes in F.Y. 1968: Extra-mural
Transportation & Facilities Research Division				
Marketing facilities, equipment and methods	8.8	2.2		
Consumer packages, shipping containers, transport equipment, and techniques	3.8	1.2	+ 1.0	- 1.2
Subtotals	12.6	3.4	+ 1.0	- 1.2
Totals - Agricultural Research Service				
/ Farmer Cooperative Service /				
Specialized Cooperative Research Program				
Cooperative marketing	4.0	0.6	- 0.5	
Totals - Farmer Cooperative Service	4.0	0.6	- 0.5	
/ Economic Research Service /				
Marketing Economics Division				
Evaluating the performance of a changing marketing system	32.3	2.5	- 4.5	- 0.8
Economic & Statistical Analysis Division				
Commodity situation & outlook analysis	9.0			
Supply, demand & price of agricultural commodities	2.5		+ 1.0	
Subtotals	11.5		+ 1.0	
Total- Economic Research Division	43.8	2.5	- 3.5	- 0.8
/ Statistical Reporting Service /				
Special Surveys Branch				
Consumer attitudes & preferences	1.6	1.7		- 0.2
Totals - Statistical Reporting Service	1.6	1.7		- 0.2
GRAND TOTALS	598.9	6.91	+ 12.8	- 0.1

I. FARM RESEARCH

RANGE MANAGEMENT
(Research Problem Area 112)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

None

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

None

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Range Management. The future of the livestock industry depends to a large degree upon the use of rangeland. Much of this land is of low productivity due to encroachment of undesirable plants and shrubs such as noxious weeds, mesquite and cedars. The future needs of the nation will require increased productivity of all rangelands. Additional research is required to find the most economical means of eliminating these competitors of the nation's grasslands. (AAP)

Action -- None

Techniques for Evaluating Range and Pasture Forages. The importance of forages to beef cattle operations is well recognized. However, techniques for determining the productive value of forages for beef cattle are inadequate. Such research should be basic and aimed at establishing a foundation of knowledge for subsequent forage evaluation studies and to serve as bases for forage breeding and cultural research. (AAP)

Action -- Expansion into this area of research was not possible and some related research in humid areas (Research Problem Area 311) had to be eliminated because of inadequate funds.

4. New or Additional Research Needs of Highest Priority

Improved Range and Pasture Usage. Research should be expanded on methods of utilizing range and pasture, together with supplementation when necessary, to obtain an optimum combination of animal gain per acre and individual animal gain. Development of improved techniques for determining intakes and nutritive values of individual forages and of potential new strains should be an integral part of the expanded research.

CONTROL OF DISEASES OF LIVESTOCK AND POULTRY
(Research Problem Area 211)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Beef	0.9	0.0	0.0	0.0
Poultry	12.5	1.5	+0.9	-0.3
Sheep & Fur Animals	0.3	0.0	0.0	0.0
Totals	13.7	1.5	+0.9	-0.3

Domestic program is supplemented by P. L. 480 funds in 2 countries totaling 58,725 U. S. dollars equivalent.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Research on causes of urinary calculi in beef cattle has been discontinued. This effort of approximately 0.9 SMY will focus on the effect of pesticides on the mineral metabolism of sheep.

Increased emphasis has been placed on Marek's disease in poultry and a small shift in emphasis was made from production management systems to the genetic aspects of lymphoid leukosis. Two contracts are planned in F. Y. 1968, one on skin leukosis and one on the genetics of Marek's disease. Research on the cause of Marek's disease was redirected as a result of the isolation of a Herpes virus as the probable cause.

New poultry research facilities are expected to be completed at East Lansing, Michigan, in early F. Y. 1970. Since funds available for construction were not sufficient to construct the necessary facilities, funds to support ongoing research in F. Y. 1969 will have to be used for this purpose.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Avian Leukosis continues to be the most baffling and costly disease in poultry. The disease is now rapidly becoming the number one disease threat to profits both in broiler production and egg production. Although much research has been devoted to the problem of leukosis for many years, there is still only limited knowledge regarding the spread of this disease and few answers are available to

curb soaring losses occurring in all phases of poultry production. The Committee commends the Agricultural Research Service on its decision to assign research on this problem to competent scientists in several locations simultaneously and believes that this approach should be enlarged and expanded wherever possible until answers are obtained or new facts discovered which would indicate a different approach for control. This will utilize the talents of more scientists on the problem. Particular emphasis should be placed on studies involving transmission, control by sanitation, and possible development of a vaccination program for Marek's disease until more fundamental and basic research can point the way toward complete eradication. (AAP)

Action -- The research is continuing at East Lansing, Michigan, and at 6 locations under contract or grants. At least two additional contracts will be made during F. Y. 1968. The relocated facilities at East Lansing, Michigan, are expected to be completed in early F. Y. 1970.

Bloat and Other Metabolic and Digestive Disturbances needs much additional research emphasis in the hope of eliminating these hazards from livestock production. In spite of encouraging advances in recent years, bloating continues to be a major problem with legume pasture, native range and in feedlot cattle. (AAP)

Action -- None

4. New or Additional Research Needs of Highest Priority

Development of Marek's Disease Vaccine. The isolation of a candidate virus of Marek's disease and development of procedures for *in vitro* propagation of the virus provides the essential information to develop a vaccine for Marek's disease. Work on this should proceed without delay because there is a reasonably good possibility that this may be the means of greatly reducing losses from this disease.

Development of Lymphoid Leukosis Vaccine. No satisfactory vaccine has been developed for lymphoid leukosis. The development of an immunizing procedure capable of protecting chickens against infection should be explored further. It is also desirable to identify chemoprophylactic agents directed against the agent tumor.

Study the Epizootiology of Marek's Disease. In these studies, special emphasis should be directed towards identifying the sources of environmental infection, the method by which infection survives in the environment, and the mechanism by which susceptible birds are infected by the environment. Such a study should also include the identification of methods by which infection could be eliminated from contaminated environments.

Genetic Studies of Disease Resistance. Most diseases which are easily controlled by vaccines, medications or other methods are now under reasonable control. Neoplastic conditions and other chronic problems have therefore become relatively more important. Simple control measures are not available. Basic information on the genetics of resistance to specific pathogens and general resistance to disease is lacking and will be necessary to reduce animal disease through breeding.

Metabolism and Health. Expanded research is needed to determine how contemporary changes in feedlot and pasture management affect the interrelationships of and requirements for nutrients by growing and reproducing beef cattle--particularly in relation to levels of non-protein nitrogen and fiber being consumed. Such investigations will supplement fundamental studies on mineral and other nutrient requirements for cattle and provide basic information needed for solution of urinary calculi, grass tetany and bloat problems.

Prevention of Bloat on Alfalfa Pasture. Research is needed to develop safe methods of pasturing sheep on alfalfa. Intensive sheep production requires full utilization of the most productive forage crops. Grazing methods are needed which will prevent losses from bloat and still permit heavy grazing at all times.

Wet-belly Disease in Mink. This disease is a common cause of reduction in value of mink pelts. Additional research is needed to determine the primary cause of the disease and to develop production practices for its control.

CONTROL OF INTERNAL PARASITES OF LIVESTOCK AND POULTRY
(Research Problem Area 212)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

Commodity	Scientist Man-years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Sheep & Fur Animals	0.1	0.0	0.0	0.0
Totals	0.1	0.0	0.0	0.0

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Studies will continue at Beltsville on the survival during winter of parasites on infested pastures and at Clay Center, Nebraska, on ecology of internal parasites.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

None

4. New or Additional Research Needs of Highest Priority

Genetics of Resistance to Internal Parasitism. Research should be initiated to determine the effectiveness of selection to increase genetic resistance to internal parasites in sheep. Internal parasites cause tremendous losses to the sheep industry and they appear to develop resistance to chemical treatment. Furthermore, very little is known of the nature of natural resistance and of the relationship between increased resistance and other production traits.

Management of Sheep to Control Internal Parasites on Irrigated Pastures. Research should be initiated to study the effects of various grazing practices on irrigated pastures on internal parasitism of sheep. Irrigated pastures with high concentration of animals are favorable to parasitism. Still the use of irrigated pastures may provide highly efficient production if parasitism can be adequately controlled.

PROTECT LIVESTOCK AND POULTRY FROM TOXIC CHEMICALS,
POISONOUS PLANTS AND OTHER HAZARDS
(Research Problem Area 213)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Beef	0.8	0.0	-0.5	0.0
Sheep & Fur Animals	0.5	0.0	0.0	0.0
Totals	1.3	0.0	-0.5	0.0

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

A shift of approximately 1.0 SMY will be made by F. Y. 1969 to support research on the effects of pesticides on the mineral metabolism of sheep and the effects of several chemicals for grub control on embryonic survival and development in beef cattle. Research on the effects of DDT on health, reproduction and growth of mink and the retention of DDT and analogs in different organs is scheduled for termination by F. Y. 1969.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

None

4. New or Additional Research Needs of Highest Priority

Chemical Interactions in the Beef Animal. The secondary effects of agricultural chemicals such as herbicides, insecticides, antibiotics and hormones in beef cattle and beef products need to be investigated in greater depth. Of particular importance is the development of principles underlying the interactions occurring among the major compounds in respect to synergistic action on the animal and ultimately the consumer.

Aflatoxins in Poultry Feed. Ducks are very susceptible to the toxicity from aflatoxins and are frequently used for assaying aflatoxins. Some people associated with the poultry industry believe that aflatoxins could be responsible for much of the mortality, morbidity and reduced performance in poultry. This is especially true since moist feed in troughs or caked feed in the litter is inducive to mold formation and aflatoxin production. This problem should be researched with poultry.

Synthetic Hormones and Chemicals in Mink Feed. Hormones and chemicals used in feeds for poultry or other farm animals with resulting residues in wastes and byproducts are a constant threat to the reproduction and well being of mink which are fed their offal. Continued research is needed to prevent loss from these chemicals.

Pesticide Studies. Investigations are needed on the effect of pesticides which may be present or accumulate in fish and in the offal of poultry and other farm animals which may be harmful to mink.

Herbicides on Range Sheep and Angora Goats. Research is needed to determine if herbicides used in range plant and brush control are harmful to sheep and goats when ingested over long periods of time.

PROTECTION OF PLANTS AND ANIMALS FROM HARMFUL EFFECTS OF AIR POLLUTION
(Research Problem Area 214)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Poultry	0.0	0.0	+0.8	0.0
Totals	0.0	0.0	+0.8	0.0

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

A review of literature will be made in F. Y. 1968 on the effects of air pollution on all species of animals. This work is supported by a grant from the National Center for Air Pollution, U. S. Public Health Service.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

None

4. New or Additional Research Needs of Highest Priority

Effect of Air Pollutants on Livestock and Poultry. Air pollution is increasing and research is needed on the acute and low-level chronic biological effects of air pollutants on animals. Not only do we need information on the physiological effects on livestock and poultry from industrial and automotive pollutants, but also from pollutants resulting from agricultural production practices. The literature review currently in progress will identify specific research needs.

Effects of Noise on Mink. Experience has shown that mink are quite susceptible to airplane and other noises. The determination of the effects of these noises upon mink could be an important factor in devising means of preventing such losses.

REPRODUCTIVE PERFORMANCE OF LIVESTOCK AND POULTRY
(Research Problem Area 310)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968 1/

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Beef	3.4	0.2	+1.0	0.0
Dairy	4.4	0.1	+0.2	0.0
Poultry	4.1	0.0	+0.9	0.0
Sheep & Fur Animals	1.9	0.2	0.0	-0.2
Swine	1.6	0.0	+0.7	0.0
Cross Species	3.0	0.0	0.0	0.0
Totals	18.4	0.5	+2.8	-0.2

Domestic program is supplemented by P. L. 480 funds in 3 countries totaling 221,557 U. S. dollars equivalent.

1/ Mid-year reductions in F. Y. 1968 reduced inputs below those shown above by the equivalent of nearly 1.0 SMY in beef and swine research in this area. Research in dairy includes approximately 1.0 SMY as a grant from the National Institutes of Health.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

In beef cattle emphasis will be placed on the endocrinology of the postpartum cow and the production of multiple births. Emphasis will be on early detection of pregnancy and increasing lambing rate per birth and year in sheep. Swine research will focus on improving storage and usefulness of semen from rams. In dairy cattle, efforts will be concentrated on the physiological mechanisms that determine if embryos entering the uterus will survive or die.

3. 1966-67 Advisory Committee Recommendations and Extent of Impelementation

Beef. In 1965, 6.5 million beef cows failed to calve. Maintenance of these barren cows cost cattlemen an estimated $526 million, equivalent to nearly 3 cents a pound of wholesale beef. Research, as proposed for the U. S. Meat Animal Research Center, Clay Center, Nebraska, on this problem should reduce these costs by 1/3 in 10 years with resulting savings to the ultimate consumer of about $175 million a year. This research includes expansion of the genetic, physiological and management aspects that would improve efficiency of reproduction of females and males to solve this number one problem of cattlemen.

Much more knowledge in physiological genetics in relation to reproduction, nutritional needs for optimum reproduction and systems of breeding beef cattle is needed. (AAP)

Action -- Vacant position at Miles City, Montana, was filled with a well trained physiologist. A mid-year budget reduction in F. Y. 1968 may lessen the progress attainable in F. Y. 1968 and 1969.

Dairy. Physiological and management research needs to be expanded. Additional knowledge is needed which would increase the reproductive efficiency of dairy cows and bulls by reducing embryonic mortality, minimize ovarian dysfunction, improve semen production and increase the efficiency of semen utilization and control of sex. (AAP)

Action -- Current research has continued with no increase in funds. A very small effort is aimed at the control of sex by the study of weight differences of sperm cells separated by sedimentation in various media.

Poultry. Rate of egg production, fertility, and hatchability continue to be major problems in both chicken and turkey production. This is especially true in the case of turkeys. It is recommended that a project or projects be developed involving studies in genetics, physiology, nutrition, management, and other appropriate areas to improve these conditions. In this connection further studies in artificial insemination, especially in turkeys, are needed. (AAP)

Action -- Research effort was expanded by approximately 0.9 SMY.

Sheep. Expanded research is urgently needed to improve the reproductive efficiency of sheep and to bring about rapid increases in the annual number of lambs weaned per ewe. (AAP)

Action -- Research to obtain two lamb crops per year will be accelerated by approximately 1.0 SMY in F. Y. 1969 if the F. Y. 1968 budget reduction in new funds are restored.

Swine. Expanded and intensified research is needed on factors effecting estrus detection, estrus synchronization, semen production, and reproductive capacity. There is a need to develop a method to deep freeze and preserve sperm cells of genetically superior boars.

Action -- One additional scientist was employed in F. Y. 1968 to study the biochemical and physical factors that influence survival of sperm cells after freezing. However, mid-year budget reductions in F. Y. 1968 made it necessary to shift and reduce the input in swine reproduction by approximately 0.5 SMY.

4. New or Additional Research Needs of Highest Priority

Reproductive Inefficiency of Beef Cattle. Further expansion of research is needed in this area which constitutes the single most important cause of lowered production efficiency in the beef industry. Comprehensive research programs on the problem should include both basic and applied studies on endocrinology, physiology, genetics, nutrition and management as related to puberty, occurrence of estrus, fertility, and pre- and post-natal mortality.

Embryonic Mortality in Livestock. The most important cause of infertility in farm animals is death of embryos. Nearly 25% of all fertilized ova die in the first few weeks in the uterus. This loss of embryos necessitates rebreeding cattle, often rebreeding sheep and sometimes rebreeding swine; otherwise, it reduces the lambing and farrowing rate in sheep and swine. Economic losses due to embryonic mortality approach one billion dollars annually. Investigations aimed at reducing embryonic loss should be pushed vigorously.

Immunological Mechanisms in Reproduction. Studies are needed to determine if antibody-antigen reactions are important causes of infertility. Basic work on the antigens of sperm and ova are needed and may be useful in selection at the genetic level and in the control of sex.

Reproduction Inefficiency of Poultry. Infertility and poor hatchability of chicken and turkey eggs continue to be major problems to the poultry industry. Increases in egg production of turkey hens and broiler parent stock will contribute greatly to reducing production costs. Research should be continued and expanded on methods of improving the fertility and hatchability of eggs and the egg production of broiler hens and turkeys. The problem should be approached through well-coordinated studies in genetics, physiology, nutrition, management, disease control, and environment. Investigations on physiological factors affecting practical diluents and semen storage should be included.

Reproductive Inefficiency of Sheep. The present lamb crop is about one lamb per ewe, per year, while a potential of more than two exists. Research to reach this potential would increase the present short supply of lamb and would provide lamb meat at lower cost to consumers. Research should be initiated and strengthened to increase ewe fertility, control sex through sperm separation, to increase lambing rates, multiple lambing, prenatal and postnatal survival, improve diagnosis of pregnancy, and to remove seasonal breeding restrictions.

Ram Fertility and Successful Storage of Ram Semen. The perfection of means to successfully freeze and store ram semen would allow widespread use of superior rams through artificial insemination. This would speed production of consumer preferred lamb by permitting more rapid gains from selection. Research should be initiated to determine the critical factors affecting loss of fertilizing capacity of stored ram semen, and to devise suitable techniques for freezing and storing ram semen.

Control of Reproduction in Fur Animals. Research is needed on the effects of light and hormones in controlling the ovarian cycle, ovulation, implantation, and prenatal mortality and especially to determine if more than one reproductive cycle per year can be obtained to realize optimum reproductive capability of mink and other fur animals.

Swine Research. Research is needed on semen preservation, synchronization of estrus and control of ovulation in order to make practical artificial insemination in swine.

Control of Sex. The control of sex of newborn livestock and poultry could result in a large reduction in the cost of production. Efforts should be made to develop techniques that will make it possible to separate or physically control and differentiate between X and Y bearing sperm cells.

FEED EFFICIENCY IN PRODUCTION OF MEAT, MILK AND EGGS
(Research Problem Area 311)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968 1/

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Beef	5.3	0.5	0.0	-0.1
Dairy	12.8	1.2	-1.5	0.0
Poultry	4.7	0.0	-1.3	0.0
Sheep & Fur Animals	1.0	0.6	0.0	-0.5
Swine	1.4	0.0	-0.2	0.0
Totals	25.2	2.3	-3.0	-0.6

Domestic program is supplemented by P. L. 480 funds in 5 countries totaling 218,786 U. S. dollars equivalent.

1/ Midyear reductions in F. Y. 1968 reduced inputs below those shown above by the equivalent of approximately 1.0 SMY in beef, 1.0 SMY in dairy and 0.6 SMY in poultry.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1968

Continued emphasis in beef will be placed on utilization of different forms of non-protein nitrogen. In Dairy, less support will be available for research on forage preservation and utilization of non-protein nitrogen. Swine research will be stressed toward nutrient requirements of newborn pigs and nutrient requirements for optimum reproductive performance.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Beef Cattle. If the feed efficiency were to be increased only 10 percent, an annual saving of approximately 252 million dollars could be made in the cost of beef production. This may be attained by expanding genetic research in this field and by fundamental research of ruminant nutrition emphasizing utilization of urea and other non-protein nitrogen sources and their relationship to fat in the ration. As protein sources become more and more expensive, expanding research into improved utilization becomes more urgent.

Action -- No expansion of research has been possible.

Beef Cattle. Fundamental research is needed to determine the mechanisms whereby various hormones and hormonelike compounds improve animal performance and the interactions of these materials with different nutrients. At the present time, these compounds are being widely used in beef cattle feeding programs yet very little is known of their mode of action in the animal body. A knowledge or understanding of mode of action could be immensely valuable in developing new compounds of greater effectiveness but with minimum side effects and residue problems.

Action -- No expansion of research in this area was possible.

North Central Dairy Cattle Forage Laboratory. A forage utilization laboratory is needed to strengthen the economic position of the modern family-size dairy farm. (AAP)

Action -- A feasibility study and report is being developed.

Poultry. Continuous research should be conducted in genetics, nutrition, feed composition, environment, and breed selection to constantly improve utilization and conversion ratios of broilers, hens and turkeys. (AAP)

Action -- No expansion of research was possible.

Sheep. Considerable research is needed on the efficiency of feed conversion to achieve more pounds of gain and pounds of red meat per pound of feed.

Action -- Research has continued on interactions of size of sire and dam with efficiency of lamb meat production at Cornell University and on factors affecting efficiency of feed utilization at both Beltsville and Dubois.

Swine. Research is needed to specify nutrient requirements of newborn pigs, assure survival and efficient growth of early weaned pigs, develop alternate sources of proteins and other nutrients and to increase overall feed efficiency.

Action -- No expansion of research or major shifts were possible.

4. New or Additional Research Needs of Highest Priority

Non-Protein Nitrogen Utilization. Expand fundamental research with ruminants which will enable non-protein nitrogen to be more efficiently utilized in roughage rations and, in turn, to permit more efficient use of low-quality roughages. At the present time, non-protein nitrogen such as urea is efficiently utilized in concentrate rations but is much less efficiently utilized in roughage type rations. Research on different types of non-protein nitrogen systems of management and dietary additions of various adjuncts should be investigated.

Digestion, Metabolism and Utilization of Fiber by Beef Animals. As competition for foodstuffs increases, the ability of beef animals to utilize plant fiber and byproduct feeds should be fully utilized. If this is to be accomplished, a more comprehensive understanding of the factors affecting efficiency of feed utilization must be reached. Research is needed to determine how the microbial population can be fully utilized for fiber breakdown, determine the effects of feed processing on fiber acceptability and utilization and to determine the other nutrient interactions related to fiber breakdown.

Genetic Efficiency of Lean Beef Production. Expand research on genetic improvement of consumer-desired lean beef production per unit of feed required in the total production process including that consumed by the brood cow. These studies will (1) determine relations of size and growth rate, particularly early in life, to amounts of feed required for growth and for maintenance, (2) explore possibilities for improving efficiency of gain independent of rate of gain, and (3) determine relations of size and growth rate to optimum point at which fat growth catches up with muscle growth. Expanded studies of single- and multiple-trait selection for characters thought to be important are needed to determine whether or not genetic limits and/or important antagonisms exist as barriers to progress.

Hormone and Hormone-Like Products in Beef Nutrition. Fundamental research is needed to determine the mechanisms whereby various hormones and hormone-like compounds improve animal performance and the interactions of these materials with different nutrients. At the present time, these compounds are being widely used in beef cattle feeding programs, yet very little is known of their mode of action in the animal body. A knowledge or understanding of mode of action could be immensely valuable in developing new compounds of greater effectiveness but with minimum side effects and residue problems.

Increase Dairy Beef Production. The large majority of the 7 1/2 million dairy bull calves are marketed as bob veals at 5-10 days of age. Yet, limited research strongly indicates that dairy steers compete well in the drylot. Holstein steers tend to be superior in daily rates of gain and efficiency of feed utilization. This apparent capability of dairy animals needs continued and increased research to determine the quality of red meat produced, consumer acceptability, genetics and interrelationships of milk and milk traits and feed conversion efficiency.

Egg Production. Egg production in broiler stock and turkeys is low. In egg-type stock an apparent ceiling has been reached which prevents further increases. Basic studies are needed in order to increase the number of eggs produced per individual, especially broiler hens and turkeys.

Nutritional Requirements of Dairy Goats. Dairy goats have the potential ability to produce large quantities of milk (up to 6,000 pounds per animal per year) in areas where feedstuffs are scarce. Research in all areas of nutrient requirements for goats is needed to utilize this potential, to the maximum for high quality food production.

Feed Utilization for Lamb Production. While the cost of feed is the largest single expense in the production of lamb meat, this cost can be reduced through the development of more efficient feeding practices. Research is needed to develop low cost but highly efficient diets for lambs in drylots as well as on pasture. Information is also needed on the most efficient pasture mixtures for sheep production, on the most efficient method of supplementary pasture forage for sheep and rapid gains of lambs, and on the effect of various nutritional regimes on the quality of lamb meat.

Range Sheep Management and Grazing Practices. Sheep production on Western ranges has been declining although almost half of the sheep in the United States are kept in the West. Even in the West, sheep production is tending to shift from ranges to farms. Improved management and feeding practices on the ranges are needed to provide more efficient production. Research should be expanded to determine supplemental practices whereby sheep may be fed more efficiently and adequately on the range.

Nutrient Requirements of Swine. More precise knowledge is needed on the nutrient requirements for all stages of the life cycle of the pig, the composition, the biological availability of nutrients of feedstuffs, and the nutrient interrelationship. A more complete study of the amino acid requirements and the availability and interrelations could result in a 20-25% reduction in protein needs required in swine feeds. Further work is needed on the development of rations that will permit us to wean baby pigs at an earlier age.

ENVIRONMENTAL STRESS IN PRODUCTION OF LIVESTOCK AND POULTRY
(Research Problem Area 312)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968[1/]

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Beef	1.0	0.5	0.0	0.0
Dairy	1.4	0.0	-0.3	0.0
Poultry	2.1	0.0	-0.3	0.0
Totals	4.5	0.5	-0.6	0.0

Domestic program is supplemented by P. L. 480 funds in 1 country totaling 11,526 U. S. dollars equivalent.

1/ Beef and dairy research support in F. Y. 1968-69 was reduced beyond that shown by the equivalent of approximately 0.5 SMY as a result of budget reductions in F. Y. 1968.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Dairy research on breeding and adaptability at Tifton, Georgia, will be terminated. Related work at Louisiana and Beltsville will be reduced. Poultry research at Arizona will be terminated.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Dairy. Research is needed to develop ways to improve the production and efficiency of milk cows under environmental stress and when managed in large numbers. Effort should be given to physiological, genetic and feed intake stress and limitations at high levels of production, recommended management systems in extreme temperatures and climatic conditions, and the adaptability of individual cows to group feeding and husbandry systems. (AAP)

Action -- None. No funds were available for this work.

Poultry. Research is needed to investigate the stress placed upon caged layers and broilers. (AAP)

Action -- None. No funds were available for this work.

Swine. Research is needed to identify the conditions of housing, ventilation, and waste removal that minimize environmental stress. (AAP)

Action -- None. No funds were available for this work.

Goats. A method is needed to protect freshly shorn Angora goats exposed to low temperature. (AAP)

Action -- None. No funds were available for this work.

4. New or Additional Research Needs of Highest Priority

Environmental Stress. Research should be expanded on the effects of environmental stress in beef cattle. Extremes in temperature, either high or low, modified by snow, rain, humidity, wind, solar radiation and the indirect effects of voluntary feed intake and forage quality cause reduced gains, lowered efficiency, lowered resistance to disease and parasites, decreased reproductive efficiency, and in extreme conditions, death. These studies should be combined with, or related to, studies on economic aspects of providing shelter or other protection from stress.

Breeding Cattle for Maximum Productivity in Specific Environments and Under Particular Management Systems. Research needs to be expanded on the question of whether beef cattle with high productivity in one environment or management system tend to be universally good or whether maximum productivity can be obtained only by selecting breeding stock specifically for each production "niche." Preliminary results with a British beef breed in two very different areas of the nation strongly suggest the existence of important specific adaptation. If this observation is confirmed, it places the nationwide use and promotion of specific breeds and bloodlines in serious question. Broadness or narrowness of the adaptation niches needs to be determined.

Stress Reduction in Large Dairy Herds. The dairy industry is rapidly moving to fewer herds and larger numbers of cows per herd. Studies have shown that production per cow is less in large herds than in smaller herds. Production also fluctuates with season of the year. Studies should be initiated to determine the limiting factors which affect these two conditions and methods need to be developed to overcome them. Knowledge is needed on the extent to which the stresses of high performance influence continued high herd productivity, health, reproduction, and product quality. Information is needed on the degree to which genetic, physiological, nutritional, husbandry and farm management capacity is a limiting factor at these stressful levels of production.

Physiological, Genetic and Feed Intake Limitations to High Production. High producing cows and hens are more profitable. Several hundred cows and a number of herds are now exceeding 20,000 pounds of milk production per cow-year. More cows and herds will be reaching this and even higher levels. Flocks of hens may average 250 or more eggs per bird per year. Knowledge is needed on

the extent to which the stresses of high performance influence continued high herd or flock productivity, health, reproduction, and product quality. Information is needed on the degree to which genetic, physiological, nutritional, husbandry and farm management capacity is a limiting factor at these stressful levels of performance. Almost no research results are available in this area of work.

Environmental Effects on Production Traits in Sheep. Tremendous differences exist among animals in their ability to grow, fatten, ward-off digestive disturbances, produce wool, and reproduce. These processes are in a large part under hormonal and biochemical control but they are affected by environmental factors such as light, temperature, and humidity. Basic research is needed to determine the effects of these environmental factors so that methods can be devised to provide more nearly optimum environments or to better alleviate environmental stresses.

IMPROVE LIVESTOCK AND PRODUCTION MANAGEMENT SYSTEMS
(Research Problem Area 313)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968[1/]

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Beef	4.7	1.0	+2.2	0.0
Dairy	7.0	0.6	+0.8	0.0
Poultry	7.8	0.0	-2.9	0.0
Sheep & Fur Animals	2.6	0.2	+1.0	-0.1
Swine	4.6	0.0	-0.4	0.0
Cross Species	2.5	0.0	+0.5	0.0
Totals	29.2	1.8	+1.2	-0.1

Domestic program is supplemented by P. L. 480 funds in 5 countries totaling 70,728 U. S. dollars equivalent.

1/ Budget reductions in midyear F. Y. 1968 reduced the SMY totals shown here by approximately 1.5 SMY in beef, dairy and swine research. In addition, they reduced the support per SMY.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Breeding and genetics research will be significantly reduced in beef cattle in F. Y. 1969. Efforts will be made to continue essential programs of work at Federally-owned locations.

In dairy, crossbreeding research at Illinois will be terminated at the end of F. Y. 1968. Also, scheduled for termination are inbreeding studies at Wisconsin, development and crossing of inbred lines at Minnesota, mating systems at Minnesota, and dairy and meat relationships among Milking Shorthorn cattle at Minnesota. A reduction of 1 SMY will be made at Ohio in work concerning development and crossing of inbred lines. Crossbreeding studies and research on other mating schemes will be reduced at Beltsville. One SMY will be added to research efforts concerned with population genetics and dairy recordkeeping. One-half SMY will be shifted to RPA 409.

In poultry, nearly 1 SMY will be shifted to RPA 310 on reproductive performance. Breeding work in sheep will involve shifts from systems of breeding to selection studies. Emphasis in swine will focus on biochemical approaches to new and improved selection aids.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Beef. Effective performance and progeny testing programs coupled with research in breeding systems and crossbreeding could develop efficiency of meat production greatly. The wide variety of environments encountered from range to confinement rearing and feeding indicate that studies into specific breeds and crosses should be expanded. Studies are needed to indicate the most suitable breeding systems that would provide an optimum national beef production industry. Also, theoretical studies are needed to develop information that could serve as a guide for the amount of seedstock needed to maintain an adequate population for a vigorous, efficient national beef herd. (AAP)

> Action -- A vacant position was filled at Knoxville, Tennessee, thus strengthening effort in the South. Overall, however, the budget reduction applicable in F. Y. 1968 and 1969 results in a considerably smaller total effort.

Dairy Production Management Systems. Production efficiency and net incomes of producers could be improved by developing dairy farm records as a management planning aide by (1) expanding the scope of dairy production records to include physical quantities and dollar costs of production inputs for the whole farm as well as the dairy enterprise, and (2) developing procedures for using dairy production and feed records as a basis for determining the most profitable composition and amount of grain and forage to feed. Research on record performances is needed to accelerate genetic progress through mass selection. Studies on weighing, testing and sampling devices are urgently needed to make possible more effective record utilization studies and on the farm applications. (AAP)

> Action -- A small effort within the framework of existing funds was initiated to do preliminary evaluation of several weighing devices. No additional funds were made available for this work.

Dairy Equipment. Basic multidiscipline research on the mechanics and physiology of miling is needed to determine more definitely the relationship of mechanical milking to the incidence of mastitis and to develop new or improved milking equipment. Also, research is needed to develop suitable meters for use in measuring individual cow production and bulk milk from tank to tank. This research is critical to the effective operation of the National Dairy Herd Improvement Program and for equitable payments to producers using bulk tanks. (AAP)

> Action -- None. No funds were made available for this work.

Mechanization of Livestock Operations. Availability of adequate labor for production of livestock, poultry, milk and eggs has become a critical problem. The chores associated with this production are onorous and confining -- 24 hours a day, 7 days a week, and 52 weeks a year. Farm labor is finding more attractive and better paying employment in the cities and in newly established nearby rural industries. To meet the competition and remain in business, the livestock producers must increase the efficiency and labor attractiveness of their operations by improving the design and layout of facilities and by using mechanical and electrical equipment to supplement available manpower. The problem is national in scope and involves all types of livestock and poultry enterprises. An integrated engineering, economic and animal husbandry research program is needed to develop and evaluate under controlled conditions of environment and management, alternative designs, layouts, equipment, controls, and production systems. (AAP)

Action -- None. No funds were made available for this work.

Sheep. Additional research is needed to increase productivity of rangeland. (AAP)

Action -- Range management research is being continued at Dubois to the fullest extent possible with funds available.

Sheep. Expanded research is needed to investigate possibilities for intensified production. (AAP)

Action -- Increased emphasis is being given at both Beltsville and Dubois to research aiding intensive production.

Sheep. Expanded research is needed to increase growth rates. (AAP)

Action -- The use of both breeding and nutrition to increase growth rates is being studied at both Beltsville and Dubois.

Rabbit. Research is needed on methods for more efficient rabbit production. (AAP)

Action -- None

Swine. Genetic research is needed to speed the development of more effective practices in swine breeding. Swine breeding research should be expanded in detecting protein polymorphisms in serum, milk, and other body fluids. (AAP)

Action -- A new technique was developed for phenotyping swine serum transferrins and prealbumins with an electrophoretic system. There was no association between backfat thickness and transferrins or prealbumin polymorphisms. Two genetic polymorphisms have been discovered in sow's milk. One is a casein protein controlled by two codominant alleles.

Action -- A project studying selection for combining ability in crosses between two strains of swine is now in the sixth selection cycle. These advantages for crosses are considerably greater than those observed in earlier cycles.

U. S. Meat Animal Research Center, Clay Center, Nebraska. Phase I, planning and letting of contracts for construction of buildings for animal husbandry research is scheduled to be completed this year. Phase II, staffing and completion of remaining facilities for animal husbandry and development of facilities scheduled for agricultural engineering and market quality research should be initiated without delay. We request that funds be made available on a top priority basis for completing Phase II.

Action -- Funds for Phase I have been appropriated and if released will allow construction to begin in F. Y. 1969. Three SMY are planned in F. Y. 1969, 0.7 for beef in RPA 313, 1.0 for sheep in RPA 311 and 1.3 for swine in RPA 313. Funds for Phase II construction have not been appropriated. Additional funds are required for completing development and staffing.

4. New or Additional Research Needs of Highest Priority

Beef Breeds and Breeding Systems. Research should be expanded on breeding systems and breed comparisons including certain dairy breeds and breeds not now present in the U. S. Work done to date indicates that crossing systems with animals developed through use of performance and progeny testing systems give greatest total performance through taking advantage of both hybrid vigor and additive genetic variation. Only a few breeds have been tested in these systems and those under a very limited number of management regimes.

Fundamental Genetics of Beef Cattle. Ultimate improvement possible in beef cattle productivity and carcass quality will in all probability depend upon improved knowledge of basic genetic processes. Therefore, research should be expanded in this area emphasizing basic studies of gene action, particularly as related to protein synthesis, genetic polymorphisms, and metabolic and anatomical defects of genetic origin.

Reducing Milk Production Costs Through Management Planning and Production Testing. Only 21% of the nation's dairy cows are enrolled on some form of production testing. Efforts to increase the use of recordkeeping by dairymen are handicapped by the lack of definite and objective data demonstrating the economic returns accompanying production testing. Extension service personnel and other educators would be materially aided by the availability of accurate cost-return data. Research is desperately needed to prove the value of testing. While milk yield per cow has increased steadily since 1960 (14%), rising production costs (15-21%) have resulted in no real increase in estimated net income, even in DHIA herds. On-the-farm studies are

needed to determine the independent influence of yield, cost and management of individual cows and farm operational management and cost factors on net farm income. Also needed is a complete on-the-farm recordkeeping system that will enable farmers to make cost-reducing management decisions on a current basis.

Optimum Use of First and Later Lactation Records of Cows. The current USDA DHIA cow and sire evaluation program is based on the use of all available records of cows. Recently, questions have been raised as to the usefulness of lactation records, other than the first, as tools for selection and genetic improvement. Research results are needed to determine if first available records only are sufficient in evaluating individual cows and sires, both nationally and within herds by individual farmers.

Genetic Control of Physiological Differences. Methods of early detection of superior animals are important in improving the merit of the U. S. dairy herd and decreasing the cost of herd replacement. Dairymen cull some 20% of first lactation heifers because of poor performance. Methods are needed to measure objectively future production potential. Detailed histochemical studies should be made of developing and mature mammary glands and tissues in an effort to discover characteristics related to differences in production between individuals and genetic groups. This is basic research aimed at looking beyond gross products of inheritance to the physiological and biochemical pathways between genes and the characters they control.

Plateau in Egg Production. It appears that a ceiling or plateau has been reached with respect to selection for increased egg production. Studies in nutrition, genetics and physiology are necessary to further improve progress in increasing the egg production of hens. Long-term selection experiments should be initiated and continued to study this important problem.

Increasing Efficiency of Animal Improvement. Genetic improvement of livestock and poultry is costly and time-consuming. Increasing the efficiency of animal improvement requires research on (1) better methods of early detection of superior animals; (2) more reliable information correlated responses particularly under the conditions of large selection differentials which can be maintained with present day sire evaluation techniques and artificial insemination; (3) improved systems of breeding, mating, and selection that can be used under extensive range conditions; (4) introduce exotic breeds and make efficient use of their desirable traits and germ plasm in developing new breeds and crosses; and (5) develop better means of locating superior sires and germ plasm already available and spreading this superior genetic material over a much wider area.

National Sheep Improvement Plan. Nationwide performance and progeny testing should be initiated to permit research on the most effective means of improving the productivity of domestic sheep. This would facilitate the location of superior sires and germ plasm already available and then this superiority could be extended over a much wider area than is now done.

Intensive Lamb Production. Sheep numbers have been steadily declining and new production methods are needed to improve the competitive condition of the industry. In most farm States sheep are produced in small flocks and do not receive the specialized attention for most efficient production. Intensive production will encourage large specialized units with greatly increased efficiency. New investigations are needed on breeding, feeding, and management practices to permit highly intensive production of lambs at all seasons of the year. This would include development of equipment and housing to reduce the man hours of labor required.

Improved Rabbit Production. Research on domestic rabbits should be undertaken. Extensive breeding and selection methods need to be developed for the improvement of meat and fur. Studies should be made of the hormonal control of the ovarian cycle and the causes and control of seasonal anestrus. Meat tolerance, and the effects of photoperiodicity, temperature, humidity and diet on productivity and fur quality need study. The nutrient requirement of the rabbit should be established, and applied studies on feeding and management should be conducted. Practically no attention is being given to these problems by State or other experiment stations.

Physiological Genetics in Swine. Research should be directed toward the identification of hitherto unrecognized polymorphisms in the blood, milk, and seminal plasma of swine. Special effort should be placed on marker genes controlling red cell antigens and serum proteins and on enzymes systems found in the serum and the hemolysate, which show considerable promise in providing basic explanations for many of the differences observed.

PRODUCTION OF ANIMALS AND ANIMAL PRODUCTS
WITH IMPROVED CONSUMER ACCEPTABILITY
(Research Problem Area 409)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Beef	0.4	0.2	0.0	0.0
Dairy	0.2	0.0	0.0	0.0
Poultry	1.3	0.0	-1.1	0.0
Sheep & Fur Animals	2.2	0.0	0.0	0.0
Swine	1.0	0.0	-0.3	0.0
Cross Species	1.8	0.0	-0.8	0.0
Totals	6.9	0.2	-2.2	0.0

Domestic program is supplemented by P. L. 480 funds in 2 countires totaling 57,255 U. S. dollars equivalent.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Milk composition work at Michigan will be terminated in F. Y. 1969. The completion of poultry facilities at Georgetown, Delaware, will make it possible to increase research on production factors that affect poultry meat quality in the amount of 1 SMY. In sheep, emphasis is placed on lamb meat and wool quality.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Beef. Research is needed on ways and means of measuring accurately the lean muscle mass in a nondestructive manner in live beef cattle. Higher grade beef carcasses average 20% waste fat. Eliminating this fat production could cut the retail price of prime and choice beef as much as 4 cents per pound. This wastage might be reduced by nearly 25% in the next 10 years with resulting annual reduction in production costs of some 84 million dollars if research needed to develop methods for increasing lean-fat ratios is pushed. (AAP)

Action -- None. No funds were available for this work.

Egg Shell Quality. Studies in genetics, nutrition and environment are needed in an effort to improve egg shell quality. (AAP)

Action -- None. No funds were available for this work.

Breast Blisters and Bruises in Poultry. Breast blisters and bruises incurred in the poultry house continue to be a major cause of downgrading in broiler processing plants. Studies in breeding, feeding, litter condition, equipment, and general management are needed to determine causes of these conditions, and recommendations developed therefrom to reduce the incidence of losses. (AAP)

Action -- It is planned to research this problem at the Georgetown, Delaware, laboratory when the laboratory is completed and staffed.

Sheep. Expanded research is needed to increase consumer acceptance of lamb meat and wool. (AAP)

Action -- Research was initiated at Dubois, Idaho, in cooperation with the Idaho State Agricultural Experiment Station on lamb meat quality. Research was on the effect of wool growth and quality during different management periods.

Swine. The pork industry needs more evidence concerning the incidence and cause of pale watery pork and factors that improve marbling and flavor. Greater research effort is needed to develop new products and production techniques that reflect a superior nutritional desirability of meatier animals.

Action -- Selection for high and low fat has continued with less than 1 SMY support.

4. New or Additional Research Needs of Highest Priority

Beef Carcass Improvement. Research should be expanded on physiology of muscle growth and fat deposition as related to ultimate consumer desirability of beef produced. This research should include both basic and applied studies of genetic, nutritional and age influences on lean-fat ratios, flavor and tenderness and should determine whether or not nutritional regimes affect these carcass characters (particularly flavor of lean) independent of effects on rates of growth and fattening.

Basic Research on Milk Synthesis. Only a beginning has been made in characterizing and understanding the variation in enzymes, hormones and various proteins connected with milk synthesis. Additional basic studies should be made to characterize the variants and determine their importance in relation to efficiency of production and consumer acceptability of dairy products.

Egg Shell Quality. Egg shell quality must be improved in order to reduce losses in market and hatching eggs. Breakage results in loss of the thin-shelled egg itself and contamination of other eggs in the nest or container. Basic and applied research is needed to increase shell strength and/or shell thickness. Relating shell strength to the microscopic structure of the shell may be one approach.

Breast Blisters and Bruises. These are responsible for heavy losses in broilers, roasters, and turkeys. Downgrading due to breast blisters and bruises, in broilers alone, costs the poultry industry an estimated $3 million annually. Management and environmental factors, genetic aspects, and disease conditions require continued investigation. The importance of current procedures of catching, loading, hauling, and handling at the processing plant also should be studied.

Consumer Preferred Lamb. Research should be expanded to identify merit of lambs both alive and in carcass, to develop effective selection methods, to determine optimum growth and development of various tissues and parts, optimum market weights, and the effects of various production factors on lamb meat. Reluctance of the public to eat lamb is an important industry problem. The industry lamb promotion program demands research to accelerate the production of high quality lamb.

Wool Fiber Length and Strength. Research should be expanded on fiber length and fiber and bundle strength to find means of reducing or eliminating the amount of short or tender fibers through improved production methods.

INSURE FOOD PRODUCTS FREE FROM TOXIC RESIDUES FROM AGRICULTURAL SOURCES
(Research Problem Area 701)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Beef	1.4	0.0	0.0	0.0
Dairy	3.7	1.6	+0.9	-0.6
Poultry	0.0	0.6	0.0	0.0
Sheep & Fur Animals	0.6	0.0	0.0	0.0
Swine	0.2	0.2	+0.2	0.0
Cross Species	8.1	0.0	+0.9	0.0
Totals	14.0	2.4	+2.0	-0.6

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

It is anticipated that two contracts will be initiated to study the effectiveness of a National Abnormal Milk Control Program. One-half SMY will be shifted in dairy from forage studies to residues of herbicides.

A reduction of emphasis at the Agricultural Chemicals, Radiation, and Metabolism Laboratory at Fargo, North Dakota, made it possible to initiate research on the metabolic fate of agricultural chemicals in poultry in F. Y. 1968.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Mastitis. Mastitis is the most serious animal health problem of the dairy industry. Because of the many factors involved in the causes and spread of the condition, much additional research is needed at the multidiscipline level directed especially at management, physiological, and genetic factors. Also, the studies should include an evaluation of the leucocyte determination as it is applied to market milk to validate an indication of mastitis in dairy cows. The leucocyte count should be clarified as a possible means of identifying mastitis in the use of herd management studies. (AAP)

Action -- Appropriated 1 SMY was made available in F. Y. 1968 for the purpose of studying the effectiveness of an abnormal milk control program and for initiating studies on comparing various leucocyte indicator tests.

Dairy Equipment and Mastitis. Basic multidiscipline research on the mechanics and physiology of milking is needed to determine more definitely the relationship of mechanical milking to the incidence of mastitis and to develop new or improved milking equipment. (AAP)

Action -- None. No funds were made available for this work.

4. New or Additional Research Needs of Highest Priority

Mastitis Control. Research on the control and prevention of bovine mastitis is undertaken and supported as a contribution to two specific goals of American agriculture, the reduction of tremendous financial loss to the dairy industry and ultimately to the consumer, and reduction of the human environmental contamination occasioned by the treatment of udder disease with antibiotics. The approach and prevention of the spread of disease through improved animal management and systems of milking hygiene is currently being pursued in a number of carefully designed research projects. An equally important avenue of attack on bovine mastitis is through studies of the fundamental resistance mechanisms of the cow. This area includes not only the discovery and description of such mechanisms, but ways in which their effectiveness in the individual animal may be defined, and ways in which they may be enhanced. Because such investigations are of great technical difficulty and presuppose real advances in our knowledge of cell and organ physiology in the cow, this approach to mastitis research has engaged relatively little attention.

Herbicide Residues in Meat and Milk. Herbicides are used to control brush, poisonous plants, undesirable range plants and as a possible means of controlling forage crop composition. Research is needed to determine if harmful residues result from continuous ingestion of herbicides by farm animals.

Pesticide Kinetics in Animals. Research on pesticide kinetics is underway and aimed at developing an understanding of the principles governing the metabolism of unnatural chemicals by animals. New effort is needed to include chemical metabolism at the subcellular level. Knowledge of the enzymatic reactions involved in chemical metabolism would speed up the evaluation of these potential pesticide hazards. Also, isolation and identification of water-soluble metabolites have been largely ignored and merit prompt attention.

Establishment of Tolerance Levels for Relatively Non-Toxic Pesticides. Fruit producers use several pesticides which appear in the pulp and other waste material after processing. Since many of these insecticides are recommended for use only in fruit production, legal tolerances for them have not been established for animal products. Under present procedures this automatically gives several relatively non-toxic pesticides such as kelthane and tedion a zero tolerance level in animal products. Several fruit waste materials have

been found to be economical cattle feeds. Their use for this purpose is impossible because residues accumulate at low levels in the animal. Research should be initiated with laboratory animals to establish safe tolerance levels in beef for these relatively non-toxic pesticide residues. Based on test animal results, these tolerances should be comparable to those previously established for more toxic chemicals such as Malathion and DDT which have proven harmless to human consumers.

PROTECT FOOD SUPPLIES FROM HARMFUL MICROORGANISMS
AND NATURALLY OCCURRING TOXINS
(Research Problem Area 702)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Dairy	1.2	0.3	-0.1	0.0
Swine	0.0	0.0	0.0	+0.8
Totals	1.2	0.3	-0.1	+0.8

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Research on the effects of aflatoxins on dairy cattle physiology and toxic milk residues will be reduced by 0.9 SMY because of lack of funds. A contract with the Battelle Institute, Ohio, on antibiotic resistance in microorganisms in poultry and swine will be completed by the end of F. Y. 1968.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Antibiotic Resistance in Man and Animals. The animal industry has been accused of being responsible for antibiotic resistance in man. It has been claimed that animal bacteria become resistant to antibiotics as a result of low level feeding in poultry and other animals. Furthermore, it has been claimed that this resistance factor is passed from bacteria in animals to bacteria in humans. Cessation of the use of antibiotics in animals, particularly in poultry, could have far-reaching impact on growth and disease control. Poultry is especially suited for studies to determine whether such claims are true. This accusation must be disproved or, if confirmed, action taken to correct the problem. (AAP)

Action -- A one year contract at the Battelle Institute was in effect in F. Y. 1968.

Salmonella. Salmonella infections constitute a serious problem in production and marketing of animal products. Research is needed on sources of infection, factors involved in cross contamination in processing, on adequate and less costly methods of detection, and on adequate methods of eliminating viable salmonella from feeds and food products. (AAP)

Action -- None. No funds were available for this work.

Basic Research on Mycotoxins. Current pharmacological research to determine the effects of feeding animals graded levels of aflatoxin and their metabolic fate should be continued and expanded. (OPS)

Action -- Budget reductions eliminated the major source of funds for this work.

4. New or Additional Research Needs of Highest Priority

Antibiotic Resistance. Research is needed to determine the extent to which resistant organisms result from the use of antibiotics in livestock and poultry production, particularly in the low levels used as growth and performance stimulants. Potential benefits from the research relate to livestock and poultry performance, food preservation and disease control in animals, plants and man.

ALLEVIATE SOIL, WATER AND AIR POLLUTION
(Research Problem Area 901)
Animal Husbandry Research Division, ARS

1. Program Changes in Fiscal Year 1968

Commodity	Scientist Man Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Dairy	0.0	0.0	+0.2	0.0
Poultry	0.0	0.1	+0.3	0.0
	0.0	0.1	+0.5	0.0

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Research at Beltsville equivalent to 0.5 SMY was initiated in F. Y. 1968. Emphasis will be placed on methods of reducing the volume of organic animal wastes and thereby reducing its contribution to the pollution problem. Cooperative research in New York is aimed at identifying and destroying the odor-producing organisms in poultry waste.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Animal Wastes. Handling and disposal of animal wastes is an increasing cost factor and animal wastes contribute to the pollution problem. (AAP)

Action -- Research on animal wastes was initiated in the amount of 0.5 SMY in F. Y. 1968.

4. New or Additional Research Needs of Highest Priority

Cattle Waste Disposal and Utilization. Animal wastes are traditionally disposed of by using as fertilizer or by removal through water sheds or sewers. Intensive feedlot production practices make these procedures impractical. Investigations of the chemistry of these waste products should be initiated to determine what alternative uses seem feasible. These studies should be aimed partially at determining if processing and refeeding as dietary components is possible. Industrial or other commercial outlets should be studied.

Waste Disposal in Poultry. Waste disposal of both broiler and laying flocks is becoming an increasingly serious problem to intensive poultry growers. Waste disposal and odor control are especially serious when operations are located in neighborhoods of encroaching real estate development, and where odors and fly populations are considered intolerable. In these and many other areas, economical litter is not available. Needed research should include:

Odor Control. The odor causing bacteria should be identified and practical methods for controlling the odor developed.

Waste Removal. Farm wastes offer a large potential market to the producer, if it can be processed economically for use by the suburban home owner. Research is needed to develop appropriate methods of processing these wastes and utilizing them. Economical ways of incinerating the waste would also be explored.

Litter Reuse. A critical shortage of currently used litter material, increased cost of securing it, and difficulty of disposing of used litter makes it imperative that research be initiated to solve these problems. Suggested research includes litter treatment to allow reuse of litter, microbial modification of litter to prevent ammonia buildup, and management modification to eliminate the need for litter.

Waste Control for Sheep. Sheep maintained on slatted floors for intensive production accumulate semi-solid wastes in a form unique to this specie. Efficient methods are needed for converting this waste to a marketable product or for disposing of it in an esthetic and safe manner. Research is needed on control of odors, on changes of the waste in storage, in soil and water, and on the physical, chemical and biological properties of such wastes.

LIVESTOCK ENGINEERING
AGRICULTURAL ENGINEERING RESEARCH DIVISION, ARS

1. Program Changes in Fiscal Year 1968

No.	Research Problem Area — Title and Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base: Intra-mural	F.Y. 1967 Base: Extra-mural	Changes in F.Y. 1968: Intra-mural	Changes in F.Y. 1968: Extra-mural
211	Control of diseases of livestock and poultry				
	Poultry engineering(influence of housing structures on disease	2.2	0.0	0.0	0.0
	Extra-corporeal irradiation of farm animal blood	0.1	0.0	0.0	0.0
	Equipment to reduce poultry disease by controlling environment	2.3	0.0	0.0	0.0
	Subtotal	4.6	0.0	0.0	0.0
312	Environmental stress in production of livestock and poultry				
	Dairy cattle engineering (housing environment)	1.0	0.0	0.0	+0.1
	Beef cattle engineering (housing environment)	1.0	0.0	0.0	0.0
	Swine engineering (housing environment)	1.0	0.0	0.0	0.0
	Poultry engineering (housing environment)	1.0	0.0	0.0	0.0
	Radiosity studies	0[1]	0.0	0.0	0.0
	Farmstead planning (animal response to sonic boom)	0.1[2]	0.0	+0.2[2]	0.0
	Subtotal	4.1	0.0	+0.2	+0.1
313	Improved livestock and poultry production management systems				
	Dairy cattle engineering (labor saving)	1.0	0.0	-0.5[3]	0.0
	Farmstead planning	1.0	0.0	+0.5[3]	0.0
	Automatic equipment for feeding beef and dairy cattle	2.0	0.0	0.0	0.0
	Equipment for automatic feeding and controlling environment for poultry	1.0	0.0	0.0	
	Subtotal	5.0	0.0	0.0	0.0

No.	Research Problem Area Title and Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base Intra-mural	 Extra-mural	 Changes in F.Y. 1968 Intra-mural	 Extra-mural
315	Improvement of general purpose farm supplies, equipment and buildings				
	Dairy cattle engineering (plan development)	0.1	0.0	0.0	0.0
	Beef cattle engineering (plan development)	0.2	0.0	0.0	0.0
	Swine engineering (plan development)	0.4	0.0	0.0	0.0
	Poultry engineering (plan development)	0.4	0.0	0.0	0.0
	Farmstead water supply	1.0	0.0	0.0	0.0
	Subtotal	2.1	0.0	0.0	0.0
701	Insure food production free of toxic residues from agricultural sources				
	Reducing pesticide residues in animal products	1.5	0.0	+0.5 4/	0.0
	Non-chemical equipment to control flies on dairy farms	0.8	0.5	0.0	0.0
	Subtotal	2.3	0.5	+0.5	0.0
901	Alleviate soil, water and air pollution				
	Farm animal wastes disposal	1.0	0.0 1/	+1.1 5/	+1.0 6/
	Subtotal	1.0	0.0	+1.1	+1.0
	TOTAL	19.1	0.5	+1.8	+1.1

1/ Less than 0.1 SMY
2/ Supported by funds from National Sonic Boom Evaluation Program
3/ Reflects transfer of effort from dairy cattle engineering to farmstead planning
4/ Reflects return to duty from training
5/ From increase appropriated, not yet allotted
6/ 0.7 from increase appropriated, not yet allotted

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Current resources will continue to be applied with only minor changes in program through FY 1969.

Work on the influence of poultry housing and management factors on condemnations and disease at the Southeast Poultry Research Laboratory, Athens, Georgia, will shift from an essentially equipment and instrument development phase to an essentially research phase.

Extramural research on modification of micro-climates to reduce reproductive and other losses in dairy cattle will be initiated during FY 1968 in cooperation with the Arizona Agricultural Experiment Station. This work will receive additional support from the American Society of Heating, Refrigerating and Air Conditioning Engineers, local bankers, and dairymen.

Temporary special assignment to investigate the effects of the sonic boom on farm animals (supported by funds from the National Sonic Boom Evaluation Program) has been completed and the engineer involved has been returned to his regular assignment.

In research on improving livestock production management systems at Davis, California, some effort will be shifted during FY 1968 from dairy and milking layouts to waste disposal aspects of dairy farmstead layout planning.

An increase of $290,000 (approximately 6 SMY) is included in the FY 1968 appropriation for expanding the research on farm animal wastes disposal and alleviation of environmental pollution. When these funds are allotted it is planned to strengthen the intramural research (presently 1 SMY) at the University of Maryland; initiate intramural research on poultry manure handling, disposal, and odor control at Cornell University (in cooperation with the Cornell Station); initiate intramural research on dairy cattle wastes at the University of Minnesota (in cooperation with the Minnesota Station); initiate intramural research on beef cattle feedlot wastes at the University of Nebraska (in cooperation with the Nebraska Station and possibly the SWC); and initiate extramural research on poultry, beef cattle feedlot, and possibly other animal wastes, probably with Cornell University, Texas Technical College, and University of Maryland.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

"Continuous research should be conducted in . . . nutrition, feed composition, environment, . . . to constantly improve utilization and conversion ratios of broilers, hens, and turkeys." (AAP)

> Action -- Facilities at Beltsville for previously planned studies on high and low energy seasonal feeds for hens laying market eggs, to be conducted in cooperation with AH, are near completion and studies will begin during FY 1968.

"Research is needed to develop ways to improve the production and efficiency of milk cows under environmental stress, . . . to identify the conditions of housing, ventilation, and . . . that minimize environmental stress in swine, . . . and to investigate the stress placed upon caged layers and broilers. " (AAP)

Action -- Research on effects of dairy cow environment on milk production is continuing in the Psychroenergetic Laboratory at Columbia, Missouri, in cooperation with the State Station, with emphasis on summer season production declines and economic potential of providing an alleviating environment. Research on the influence of various elements of environmental stress on swine is continuing at Davis, California, in cooperation with the State Station, with emphasis on effects of temperature, humidity, nutrition and exercise. Facilities at Beltsville for conducting previously planned cage density studies, with emphasis on environmental aspects, in cooperation with AH, are nearly completed and studies will begin during FY 1968. Previously developed laboratory data on heat and moisture production of broilers were field tested and found suitable for use in design of insulation and ventilation systems for broiler houses.

"Availability of adequate labor for the production of livestock, poultry, milk, and eggs has become a critical problem . . . An integrated engineering, economic, and animal husbandry research program is needed to develop and evaluate, under controlled conditions of environment and management, alternative designs, layouts, equipment, controls and production systems." (FRF, AAP)

Action -- Some research effort at Davis, California, on improving design and layout of facilities to reduce labor requirements in handling and milking dairy cows is being shifted to developing principles for improving overall farmstead layout planning for dairy and other livestock production.

"Pure water is a basic requirement of farmstead operations . . . demands . . . are continually increasing in the face of increasing sources of contamination. Studies should be initiated immediately to find ways and means of insuring adequate supplies . . . to meet these farm requirements . . . satisfactory methods for effectively and economically treating the water to make it safe for use should be developed." (FRF)

Action -- None

"The urgent need for greatly expanding the work on waste disposal is emphasized by the Committee for the third time. . . We again strongly urge that an adequate expansion of both personnel and facilities to speedily carry out this work to a satisfactory conclusion be provided. We recommend that this work be headed up by the Agricultural Engineering Research Division, ARS, including personnel from all disciplines who can aid in conducting this work." (FRF)

"Handling and disposal of animal wastes is an increasing cost factor as well as a major management problem . . . the problem is increasing as the result of antipollution pressures . . . additional research is needed to develop more efficient systems with lower operating costs. Also . . . to provide, basic design criteria for the development of alternative disposal systems and . . . prototype systems to assist in the solution of the problem." (AAP)

> Action -- Research on improved means for handling, disposal, and/or reclamation of farm animal wastes has been continued at the University of Maryland. At Cornell, a small extramural study was initiated on the poultry manure handling problem, concentrating on the odor control aspects. An increase of $290,000 for expanding the research on farm animal wastes is contained in the FY 1968 appropriation.

"A concentrated program is needed for research on electric farmstead equipment for handling feeds and other materials involved in livestock and milk production. During the period 1940-44 to 1965 the labor required to produce corn was reduced from 25.5 to 5.8 man-hours per acre, a 77 percent reduction. During a comparable period labor required in man-hours per milk cow was reduced from 142 to 84, a 41 percent reduction. Comparable figures for beef cattle are 4.0 and 2.4 man-hours per 100 pounds, which is only a 40 percent reduction in man-hours per 100 pounds. Automatic equipment is needed at reasonable cost that will eliminate laborious tasks and provide more efficient production." (FRF)

"In view of the great and urgent need for labor and cost reduction in the farmstead area, the allocation of only 3.8 scientific man-years to USDA research in this entire area appears woefully inadequate and particularly so in the field of livestock equipment which receives only 1.3 scientific man-years of effort. Because the application of electric power to replace human effort appears to offer such promising potential here, a doubling and then a redoubling of research effort in this area would appear quite justified and is urgently recommended." (FRF)

"This program of research (U. S. Meat Animal Research Center, Clay Center, Nebraska) for the future calls for a substantial addition of Federal and State scientist man-years by 1977 to deal with such problems as reproductive inefficiency, efficiency of feed utilization, animal waste disposal, integrated production and management systems, and acceptability of animal products." (AAP)

Action -- None

"Research to further study the radiation wavelengths, ultrasonics, or other stimuli as to their attraction or effect on various insects should be continued to supplement the trap studies, and the possible application of their use in controlling insects and diseases of plants and animals." (FRF)

Action -- None

4. New or Additional Research Needs of Highest Priority

Bioengineering research to reduce environmental stress and disease in livestock. Annual losses in mortality and reduced production are estimated at $2.7 billion. The trend toward confinement operations and larger numbers of animals per production unit is making the situation more urgent. Many important engineering problems are involved in controlling the adverse environmental stresses that reduce production, in preventing the incidence and transmission of disease, and in treating diseases. The problems are both complex and national in scope. The little research now underway in this area urgently needs to be greatly expanded in view of the long lead time necessary before results can be conclusive.

Labor and cost reduction in livestock production. Availability and cost of competent labor for production of livestock and livestock products remain major problems. Some producers--particularly dairymen--are being forced out due to labor shortages and other high production costs. Labor requirements must be reduced if production is to remain competitive and be maintained as an important source of protein. The problem is national in scope and involves all types of livestock enterprises. An integrated engineering, economics, and animal husbandry approach is needed to develop and evaluate alternative designs, layouts, equipment, controls and production systems--considering both investment and operating costs.

Water supply. Adequate and safe supplies of farmstead water are becoming a matter of increasing concern, with larger, more concentrated livestock operations and the need for water as a tool in labor reducing practices. Contamination of water supplies is also an increasing hazard. Additional research is needed to develop criteria and techniques for adequate water supplies for cleaning, livestock drinking water, and other uses. Additional effort is needed in the development of techniques and recommendations for safeguarding and treatment of water supplies with reference to the increasing possibility of chemical and pathogenic contamination.

Improve management and alleviate pollution from livestock wastes. Pollution of air, water, and soil from livestock wastes is a major national problem. Animal wastes handling and disposal constitute a significant burden to production costs--increasing in magnitude as antipollution pressures increase. Narrow profit margins, market uncertainties and lack of offsetting profits from waste by-products has made it unrealistic to expect producers to develop and finance waste handling systems on their own. An extensive, long term research program is needed to evaluate the contribution to the problem of each type of waste as affected by climatic conditions, types of feed, terrain, housing, management system, and proximity of "neighbors"; to determine basic physical and biochemical characteristics of the wastes; and to develop systems for economical and sanitary handling and disposal or reclamation. Leadership should be established in the Agricultural Engineering Research Division, ARS, and adequate coordination should insure that it fits in with sound and efficient livestock management practices.

Milking machine design as related to milking efficiency, udder health, and the efficient use of labor. The total cost of bovine mastitis in this country has been estimated to exceed $400 million annually. To date, researchers have been unable to pinpoint the causes of this disease; however, most believe deficiencies in milking procedures and equipment are major contributing factors. Under present conditions it costs dairy farmers over $2 million a day just for the milking operation. An intensive study of milking by engineers, bacteriologists, physiologists, and dairy husbandmen is urgently needed.

Labor reduction in livestock production. Facilities and staffing are urgently required at the Meat Animal Research Center, Clay Center, Nebraska, for research on electric equipment for labor reduction and more efficient production.

Control of vectors of poultry diseases. Recent reports indicate that insects, birds, and rodents may be vectors in the spread of Marek's disease, salmonellosis, and other poultry diseases. Engineering studies on the control of insects in poultry houses and on isolation of poultry from other disease vectors is needed.

INFECTIOUS AND NONINFECTIOUS DISEASES OF CATTLE
(Research Problem Areas 211, 707)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Vibriosis	0.6			
Tuberculosis	1.0	0.2		
Mucosal-respiratory disease complex	1.0	0.2		-0.2
Mastitis of cattle	4.0	0.2	+0.5	
Epizootic bovine abortion	0.5	0.3		
Foot rot (Pododermatitis)	0.3			
Pulmonary adenomatosis	0.3			
Leptospirosis	2.0			
Enteritis of young calves		0.5		
Bovine lymphosarcoma	3.0	1.3		
Respiratory diseases of cattle (Shipping fever)	3.5			
Infertility in cattle	0.5		-0.5	
Brucellosis	1.0	0.2		
Paratuberculosis of cattle (Johne's disease)	1.0	0.3		-0.3
Keratitis (Pinkeye)	2.0			
Total	20.7	3.2	0	-0.5

Domestic program is supplemented by P.L. 480 funds in two countries totaling 176,598 U. S. dollars equivalent over a period of 5 years.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

No major changes proposed. Basic and applied studies on the above listed diseases will be continued.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Expand research to eradicate or control the following dairy and beef cattle diseases: calf scours, foot rot, pinkeye (infectious keratoconjunctivitis), vibriosis, leptospirosis, bovine lymphosarcoma (leukosis), bluetongue, brucellosis (Bang's disease), tuberculosis, and paratuberculosis. Expand research on mastitis of dairy cattle including basic interdisciplinary research on the mechanics and physiology of milking as related to this disease. Intensify research on bloat, milk fever (hypocalcemia), acetonemia (ketosis) in dairy cows, and respiratory

disease complex including the information on causative agents and preventive and therapeutic measures. (AAP)

Action -- Research on mastitis is being continued and expanded to include further studies on abnormal milk.

The study of the Mycoplasma infection in bovine reproduction will be terminated in 1968.

4. New or Additional Research Needs of Highest Priority

None. Some realignment of scientists and revisions of current investigations may be made to increase emphasis on problems that may arise during the reporting period.

INFECTIOUS AND NONINFECTIOUS DISEASES OF SWINE
(Research Problem Areas 211,707)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Hog cholera	4.5	0.2		
Erysipelas	1.0			
Brucellosis	1.0			
Abscesses	1.0	0.5	+ 1.6	+ 0.4
Atrophic rhinitis	0.5			
Transmissible gastroenteritis	2.0	0.2		
Totals	10.0	0.9	+ 1.6	+ 0.4

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Funds have been appropriated for the additional research on swine abscesses.

3. 1966-1967 Advisory Committee Recommendations and Extent of Implementation

Give more attention to research on swine diseases with special emphasis on abscesses of the neck and jowl, respiratory-diseases complex (virus pneumonia, influenza, and pasteurellosis), mastitis-metritis complex, and enteric infections. (AAP)

Action -- Active research is in progress at the National Animal Disease Laboratory, Ames, Iowa, on swine abscesses, pasteurella infections, transmissible gastroenteritis, atrophic rhinitis, erysipelas, streptococcal infections, and hog cholera. These studies relate directly to all of the aforementioned problems.

4. New or Additional Research Needs of Highest Priority

None.

INFECTIOUS AND NONINFECTIOUS DISEASES OF SHEEP AND GOATS
(Research Problem Areas 211, 213)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intramural	Extramural	Intramural	Extramural
Bluetongue	4.0			
Vibriosis	0.3	0.1		
Paratuberculosis	2.0			
Ulcerative dermatosis		0.1		
Toxicological effects of oxalate-containing plants	1.0			
Identification of teratogenic agent in **Veratrum californicum;** toxicity of 2 lupine species	1.0			
Scrapie	0.3		- 0.3	
Totals	8.6	0.2	- 0.3	

Domestic program supplemented by P. L. 480 funds in two countries totaling 199,137 dollars equivalent over a period of 2 years.

2. Plans for Change in Use of Current Resources Through Fiscal Year 1969

It is anticipated that the current program will be continued without change.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Accelerate and broaden research on epididymitis, mastitis, scrapie, bluetongue, vibriosis, foot rot, and listeriosis, of sheep and goats. (AAP)

Action -- Research relating to the problems of epididymitis and mastitis is in progress under the projects on brucellosis and pasteurellosis. The toxicological effects of poisonous plants are also studied (for details see section on miscellaneous diseases.)

4. New or Additional Research Needs of Highest Priority

None.

DISEASES AND PARASITES OF HORSES

(Research Problem Areas 211, 212)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Equine piroplasmosis	3.3	0.5		- 0.5
Equine infectious anemia (swamp fever)	0.5	1.1		+ 0.5
Totals	3.8	1.6		0

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

None

3. 1966-1967 Advisory Committee Recommendations and Extent of Implementation

Resume research on diseases of horses emphasizing the following diseases: equine piroplasmosis, equine infectious anemia (swamp fever), reproductive diseases, and diseases resulting from lack of required nutrients. (AAP)

Action -- A program of research, equivalent to 3.3 SMY, has been expanded on equine infectious anemia.

4. New or Additional Research Needs of Highest Priority

None

INFECTIOUS AND NONINFECTIOUS DISEASES OF POULTRY
(Research Problem Areas 211, 707)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Ornithosis	0.5			
Salmonellosis	1.3	0.8		-0.1
Chronic respiratory disease complex	3.5	1.2		
Newcastle disease	2.0	0.4		
Hemorrhagic enteritis		0.3		-0.3
Infectious bronchitis	2.2			
Bluecomb		2.7		-1.3
Airsacculitis	2.0	1.2		
Total	11.5	6.6		-1.7

Domestic program is supplemented by P.L. 480 funds in three countries totaling 154,500 U.S. dollars equivalent over a period of 4 years.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Basic and applied research will continue on the diseases listed above.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Initiate research to control Gumboro disease (avian nephrosis). Expand research to determine the precise relationship of various etiologic agents of avian leukosis and hosts. Develop techniques and tests to identify infected birds and flocks and procedures to protect susceptible birds from mycoplasma. Direct research on salmonellosis to identify carriers and all sources of initial exposure. Initiate research on hemorrhagic enteritis in turkeys. (AAP)

Action -- Intensive research continues on mycoplasma infection of chickens and turkeys (chronic respiratory disease and airsacculitis). Research has been initiated on bluecomb and hemorrhagic enteritis.

4. New or Additional Research Needs of Highest Priority

None.

INFECTIOUS AND NONINFECTIOUS DISEASES OF FUR ANIMALS
(Research Problem Area 211)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Fur animal diseases	1.0	0.9		-0.7
Transmission of infectious diseases by helminths	2.0			
Abortion and other diseases of rabbits		0.6		
Total	3.0	1.5		-0.7

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

The program will continue as reflected above.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Accelerate research to determine the role of gastrointestinal parasites in transmitting infectious diseases. (AAP)

Action -- The study of diseases of rabbits has been initiated.

4. New or Additional Research Needs of Highest Priority

None

MISCELLANEOUS INFECTIOUS AND NONINFECTIOUS DISEASES OF ANIMALS
(Research Problem Areas 211, 213, 707)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Components of normal and immune serum	2.0			
Preparedness for diagnosis of foreign animal diseases	2.7		+1.7	
Alleviators and diagnostic tests for plant poisoning			-1.0	
Biochemical effects of agricultural chemicals	2.0		+0.2	
Detoxication mechanisms in cattle and sheep	1.0		+0.3	
Cytological responses to antiparasitic and other agricultural chemicals	1.0		+0.2	
Toxicological and pathological effects of pesticides	3.0		+0.3	
Mycotic diseases of domestic animals	2.0			
Proteins and other complex molecules from animal disease agents derived primarily from surface structures and extracellular products	2.0			
Chemical and physical studies on microbial antigens	2.0			
Microbiology of the ruminant digestive tract and its relation to digestive disturbances	1.0			
Physiology of normal mammalian cells grown in tissue cultures	1.0			
Metabolic, antigenic, and pathogenic characteristics of Dermatophilus congolensis	1.0			
Delineation of motor centers in the brain that are associated with motility of the ruminant esophagus and stomach	1.5			
Physiological fate of rumen gases absorbed from the lungs following eructation	1.5			
Correlation of the ultrastructural and biological properties of animal pathogens	1.5			
Cellular reaction to intracellular microbial agents	5.0			
Placenta, fetus, and fetal abnormalities in domestic animals			+1.0	

Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
The effects of mycotoxins on animals	1.0			
Relationship between psittacosis-group agents found in wild and domestic birds and domestic mammals	0.5			
Teratogenic and toxic compounds from poison plants	2.0			
The role of parathyroid hormone and thyrocalcitonin in calcium metabolism	1.0			
Studies of pituitary-adrenal function in cattle	1.0			
The toxicological effects of loco plants on livestock	1.0			
Development and modification of equipment for greater laboratory and animal room safety	1.0			
The role of physical, chemical, and biological aerosols in domestic animal diseases	1.0			
Total	39.7		+2.7	

Domestic program is supplemented by P.L. 480 funds in two countries totaling 79,385 U.S. dollars equivalent for a period of 5 years.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

No major changes in the current program are planned.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Continue research on plant, chemical, and radioactive toxic substances. (AAP)

Action -- Architectural plans for the Southwestern Veterinary Toxicology and Livestock Insects Research Laboratory, College Station, Texas, have been completed. The study continues on the toxicological effect of poisonous plants and pesticides.

4. New or Additional Research Needs of Highest Priority

None

FOOT-AND-MOUTH AND OTHER EXOTIC INFECTIOUS DISEASES OF CATTLE
(Research Problem Area 211)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1967

Activity	Scientist Man-Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Studies on foot-and-mouth disease virus vaccines	1.8		- 0.7	
Determine mechanism of antibody formation	1.7		+ 0.1	
Quantity production of foot-and-mouth disease virus	0.2			
Establishment and characterization of cell lines and cell strains	0.1			
Mechanism of the interaction between foot-and-mouth disease virus molecules and host cells	4.6		+ 0.4	
Genetic biochemistry of foot-and-mouth disease virus	1.1		+ 0.1	
Effects of chemical and physical environment on foot-and-mouth disease virus	2.3		+ 0.2	
Bulk freeze drying of foot-and-mouth disease virus vaccine and antiserum	0.6			
Chemical and physical structure of foot-and-mouth disease virus and other exotic animal viruses	0.3			
Immunochemical investigations of foot-and-mouth disease virus	1.3		+ 0.1	
Attenuation of representative types of foot-and-mouth disease virus	0.3			
Biological mechanism of natural resistance and susceptibility to foot-and-mouth disease virus	0.9		+ 0.1	
Biological alteration of foot-and-mouth disease virus from continual residence in cell cultures	1.2		+ 0.2	
Morphological aspects of virus-cell relationships	1.0		+ 0.1	
Diagnostic and immunizing procedures for contagious bovine pleuropneumonia	2.6			
Studies on carriers of foot-and-mouth disease virus	4.8		+ 0.4	
Total	24.8		+ 2.4	

Domestic program is supplemented by P. L. 480 funds in two countries totaling 384,337 U. S. dollars equivalent over a period of five years.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

None

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Continued and expanded study of foot-and-mouth disease. The study of several exotic diseases in under continued study.

4. New or Additional Research Needs of Highest Priority

None

FOOT-AND-MOUTH AND OTHER EXOTIC DISEASES OF SWINE
(Research Problem Area 211)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F. Y 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Foot-and-mouth disease of swine	0.8		+0.1	
African swine fever	5.2		+1.3	
Total	6.0		+1.4	

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

The current lines of research will be continued.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

No recommendations submitted.

Action -- None

4. New or Additional Research Needs of Highest Priority

None

FOOT-AND-MOUTH AND OTHER EXOTIC DISEASES OF SHEEP
(Research Problem Area 211)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Foot-and-mouth disease of sheep	0.6			
Total	0.6			

Domestic program supplemented by P.L. 480 funds in two countries totaling 66,014 U.S. dollars equivalent over a period of 5 years.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

None

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

None

4. New or Additional Research Needs of Highest Priority

None

PARASITES AND PARASITIC DISEASES OF CATTLE
(Research Problem Area 212)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Host-parasite relationship of coccidial parasites of cattle	1.0			
Clinical and physiological aspects of roundworm parasitism in cattle, including anthelmintic treatment		0.1		
Investigations of trichomonad parasites		0.1		-0.1
Host-parasite relationship of intestinal worms, Cooperia spp. in cattle	1.0		1/ -1.0	
Epizootiological and ecological investigations of the internal parasites of grazing cattle	1.5		1/ -1.5	
Etiology and immune response of cattle to winter coccidiosis	1.0		1/ -1.0	
Anaplasmosis of cattle	2.3		+3.0	
Interrelationships of diet and parasitic infection in the production of cattle	1.0		1/ -1.0	
Parasites of cattle with emphasis on stephanofilarial species	0.2			
Effect of stocking rate and rotational grazing on internal parasitism of beef yearlings	2.0		1/ -1.0	
Effect of host diet on the bionomics of the preparasitic stages of nematodes in cattle feces	0.5			
Effects of level, rate, and period of exposure to larvae on the establishment and pathogenesis of gastrointestinal nematode parasites of cattle	1.1			
Life history and host parasite relationship of nematode parasites	0.4			

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Activity	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Investigations of gastrointestinal nematodiasis in cattle			+ 1.2	
Chromosome studies of coccidia and nematodes in ruminants			+ 0.5	
Oxygen uptake of coccidia and nematodes in ruminants and laboratory animals			+ 0.5	
Total	12.0	0.2	- 0.3	- 0.1

Domestic program is supplemented by P.L. 480 funds in one country totaling 104,760 U. S. dollars equivalent over a period of 5 years.

1/ realignment of program

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Research will continue at approximately the same level.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Expand research on anaplasmosis and trichomoniasis. Accelerate research on gastrointestinal parasites and ringworms. (AAP)

Action -- Additional effort is now being devoted to studies concerned with biological and immunological aspects of gastrointestinal parasites.

4. New or Additional Research Needs of Highest Priority

None

PARASITES AND PARASITIC DISEASES OF SWINE
(Research Problem Area 212)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Pathogenic role of the intestinal roundworm		0.1		
Investigations of Trichinella spiralis	0.5		+2.5	
Strongyloides ransomi infections in baby pigs	0.4			
Biochemical and other aspects of the host-parasite relationship in the development and severity of helminthiasis in swine	1.0			
Life cycle of the nodular worm of swine	0.3			
Infection of the dung beetle, Phaneaus vindex, with larvae of the thick stomach worms	0.3			
Swine kidney worms		0.1		
Total	2.5	0.2	+2.5	

Domestic program supplemented by P.L. 480 funds in one country totaling 117,569 U.S. dollars equivalent over a period of 5 years.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Program will continue without change.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Intensify research on sources of infection of pork by the trichina parasite. (AAP)

Action -- Proposed expansion of research on trichinosis carries a high priority in the program planning on swine parasites.

4. New or Additional Research Needs of Highest Priority

None

PARASITES AND PARASITIC DISEASES OF SHEEP AND GOATS
(Research Problem Area 212)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Gastrointestinal nematodes	1.7	0.1	+0.1	
Life histories, biology, pathogenesis and control of helminth parasites of sheep in the Southwest	1.8			
Life cycles of sheep coccidial parasites	0.5			
Effect of intestinal roundworms on the tensile strength and sulfur content of wool		0.1		-0.1
Chemical control of sheep nose bot *Oestrus ovis*	0.8			
Biology and control of *Psorergates ovis*, the Australian itch mite of sheep	0.2			
Pathobiology of laboratory and field strains of *Psoroptes ovis*	0.5			
The biology and control of liver flukes	1.0			
Total	6.5	0..2	+0.1	-0.1

Domestic program is supplemented by P.L. 480 funds in two countries totaling 234,602 U.S. dollars equivalent over a period of 5 years.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

The program is expected to continue as shown above.

3. 966-67 Advisory Committee Recommendations and Extent of Implementation

Initiate research on lungworm infections in sheep. (AAP)

4. New or Additional Research Needs of Highest Priority

None

PARASITES AND PARASITIC DISEASES OF POULTRY
(Research Problem Area 212)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F. Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Biological investigations of protozoan parasites and parasitic diseases, with special reference to those of the gastrointestinal tract	1.6	0.3		
Total	1.6	0.3		

Domestic program is supplemented by P.L. 480 funds in one country totaling 13,245 U.S. dollars equivalent over a period of 3 years.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Program is expected to continue as shown above.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Continue basic research on coccidiosis and the control measures. (AAP)

Action -- Biological investigations of parasitic diseases of poultry have been continued.

4. New or Additional Research Needs of Highest Priority

None

TREATMENT FOR REMOVAL OF PARASITES
(Research Problem Area 212)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F. Y. 1967 Base		Changes in F. Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
New and improved anthelmintics	1.2			
Evaluation and standardization of antiparasitics	2.7			
Control of lice on cattle	0.5			
Total	4.4			

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

No changes proposed.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Study the effect of chemotherapeutic agents, and develop prophylactic methods.

Action -- Evaluation of antiparasitics has high priority in the research

4. New or Additional Research Needs of Highest Priority

None

MISCELLANEOUS PARASITES AND PARASITIC DISEASES
(Research Problem Area 212)

Animal Disease and Parasite Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity	Scientist Man-Years (Estimated)			
	F. Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Publication and maintenance of author, subject, and host index-catalogues	1.0			
Immunologic and other biologic approaches to the prevention and control of parasitic diseases	3.6			
Chemical and physical elements of parasites and parasite-host relationship	3.0			
Taxonomic investigations and identification of parasites	1.8			
Maintenance of parasite collection	1.4			
Function of hemoglobin in parasites	1.1			
Biology, epidemiological and pathogenicity of demodectic mange	1.0			
Cytological investigations of protozoan parasites that penetrate the gastrointestinal tract of poultry and other farm animals	2.7			
Identification of parasites important to human and animal health	0.7			
Total	16.4			

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

None

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

None

4. New or Additional Research Needs of Highest Priority

None

LIVESTOCK INSECTS AND OTHER ARTHROPODS
Entomology Research Division, ARS

1. Program Changes in Fiscal Year 1968

A. By Problem Areas		Scientist Man-Years (Estimated)			
		F.Y. 1967 Base		Changes in F.Y. 1968	
No:	Title and Activity	Intra-mural	Extra-mural	Intra-mural	Extra-mural
210	Control of insect pests of livestock and poultry				
	Basic biology, physiology and nutrition	5.5	2.0	-0.2	+0.7
	Insecticidal and sanitation control	8.8	0.8	-1.7	+0.1
	Biological control	3.5	0.8	-0.1	
	Insect sterility, attractants and other new approaches to control	7.0	1.0	+2.0	
	Insect vectors of diseases	2.2		+1.0	
	Subtotal	27.0	4.6	+1.0	+0.8
701	Insure food products free from toxic residues from agricultural sources				
	Insecticide residues in livestock	3.8			
	Subtotal	3.8			
901	Alleviate soil, water and air pollution				
	Insecticide residues in wild game	0.5			
	Subtotal	0.5			
	TOTAL by Problem Areas	31.3	4.6	+1.0	+0.8

B. By Commodities				
Poultry	4.3	0.9		+0.2
Beef cattle	11.5	1.9		+0.2
Dairy cattle	11.3	1.4		+0.1
Swine	0.2			+0.1
Sheep and wool	3.4	0.4		+0.1
Other animals	0.6		+1.0	+0.1
TOTAL by Commodities	31.3	4.6	+1.0	+0.8

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1968

Increasing attention will be given to insect sterility and other new approaches to control, to attractants, and to insect vectors of animal diseases. Anticipated closure of a laboratory at Corvallis, Oregon, during the year will permit strengthening of research at various locations. In addition, one new hire permits strengthening the research on insect vectors of animal diseases.

Studies will be made of new insecticidal compounds that appear promising for control of livestock pests to determine whether residues of the insecticides or their metabolites will appear in animal tissues or milk. The amount and persistence of such residues will be determined after the insecticides have been applied to the animals or have been fed to them. Residues in feed, forage, and silage following use of these new insecticides on the crops also will be investigated.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

The Committee is concerned with the lack of emphasis given to insects associated with livestock and poultry diseases. Because of the importance of this phase of research, we urge that additional funds and facilities be made available for this type of work. Studies should include the life cycle of insects, their part as vectors or reservoirs of disease-producing agents, mode of transmission of disease to livestock and poultry, and the use of biological and chemical agents in the control of such insects. (AAP)

It is recommended that increased attention be given to the role of arthropods in the transmission of animal diseases such as bovine anaplasmosis, equine piroplasmosis and bluetongue and of such poultry diseases as fowlpox, avian leukosis, and **leucocytozoonosis.** (PSE)

> Action -- Support for these problems **remains at approximately** the same level. However, increased attention is being provided through certain readjustments in the research program. The projected closure of the Corvallis laboratory will permit assignment of additional personnel to the animal disease vector problems at several locations.

Anaplasmosis, caused by a blood parasite, continues to cause serious losses both in morbidity and mortality in cattle. There is urgent need to better characterize the organism and to find a suitable experimental animal so that additional knowledge may be developed about transmission, especially by insect vectors. (AAP)

> Action -- During F.Y. 1968, full time research on this problem is again possible with hiring of new scientific personnel. Formerly research efforts had to be shared between this important problem and equine piroplasmosis.

Equine piroplasmosis, a protozoan disease that is transmitted by ticks, is under study. While some progress has been made, there is urgent need for more research on insect vectors, and the character of the causative agent in the vectors. (AAP)

Action -- The additional scientist in F.Y. 1968 has permitted expanding this research to a full-time basis. Formerly no more than half a professional man-year could be devoted to this important problem, because of pressing needs with other insect disease vector research.

Bluetongue, considered to be primarily a disease of sheep, has been diagnosed in cattle. The effective research program on the disease should be expanded and accelerated to develop a means of identifying carrier animals and to identify additional possible vectors. (AAP)

Action -- Transfer of personnel to Denver, Colorado, is scheduled during F.Y. 1968. This will strengthen research on vectors of bluetongue disease and increase the entomological cooperation with veterinarians studying this disease.

Avian Leukosis continues to be the most baffling and costly disease in poultry. The disease is now rapidly becoming the number one disease threat to profits both in broiler production and egg production. Although much research has been devoted to the problem, there is still only limited knowledge regarding the spread of this disease. ------ Particular emphasis should be placed on studies involving transmission, control by sanitation, and possible development of a vaccination program for Marek's disease until more fundamental and basic research can point the way toward complete eradication. (AAP)

Action -- Research has been initiated on a possible vector of Marek's disease, the lesser mealworm beetle, Alphitobius diaperinus, through extended cooperative agreement with the University of Maryland. This research is in cooperation with Market Quality Research Division.

The "National Program of Research for Agriculture" points out the need for research on protection of animals from toxic chemicals and other hazards: "Livestock and pountry may suffer losses in productivity from atmospheric pollutants and pesticide residues remaining on crops used for animal food." Continued research is needed on chemical and other toxic substances. (AAP)

In studies of the problem of residues in the environment, it is strongly urged that the government agencies involved be encouraged to study not only the amount of pesticide residues present, but whether they pose a significant physiological hazard to either man or animals. (PSE)

Action -- During F.Y. 1967 studies were made of the extent to which residues of insecticides or their metabolites would appear in cattle tissues and milk as a result of spraying or dipping of the animals or consumption of feed containing residues. These studies included investigations of the amount and persistence of residues from DDT, dimethoate, Dursban, Shell SD-8447, and Stauffer R-3828 in animal tissues; Azodrin, Bidrin, coumaphos, dimethoate, Dursban, Imidan, malathion, Mobil MC-A-600, and Niagara NIA-10242 in milk; dimethoate Dursban, Imidan, Mobil MC-A-600, and Niagara NIA-10242 in corn, grass, or silage.

4. New or Additional Research Needs of Highest Priority

Screw-worm. Research is urgently needed on the biology and ecology of the screw-worm fly in Mexico, improvement of the quality of reared flies, development of special strains, and development of effective attractants for use in support of the planned screw-worm eradication program in Mexico.

Poultry Mites. There is an urgent need for research on biology and control of the mite Neoschongastia americana. This chigger-like mite that attacks poultry on the range, produces ugly lesions that must be cut out of the meat, resulting in downgrading of the birds, thus causing serious financial losses to growers. Turkey producers especially suffer in this respect as the young birds are placed on the range at an early age.

Insect Vectors of Livestock Diseases. Additional research is needed on insect vectors of livestock diseases, specifically bluetongue of sheep and cattle, piroplasmosis of horses, and anaplasmosis of cattle. Additional information is required on the role played by arthropod vectors of these diseases, the role they play in transmission, and on the development of efficient methods for control. Currently resources do not begin to meet our obligations to cooperators in these vital studies.

Pesticide Residues. There is an urgent need to develop a method for putting thin-layer chromatography of pesticides on a quantitative basis. This would be of great aid to residue determinations in animal tissues and animal products.

Staffing. Complete staffing should be provided for the Southwestern Veterinary Toxicology and Livestock Insects Research Laboratory at College Station as soon as it is completed.

II. NUTRITION, CONSUMER USE AND UTILIZATION RESEARCH

HUMAN NUTRITION AND CONSUMER USE RESEARCH
Consumer and Food Economics Research Division, ARS
Human Nutrition Research Division, ARS

1. Program Changes in Fiscal Year 1968

No.	Problem Area / Title and Activity	Scientist Man-years (estimated) F.Y. 1967 Base: Intra-mural	F.Y. 1967 Base: Extra-mural	Changes in F.Y. 1968: Intra-mural	Changes in F.Y. 1968: Extra-mural
702 & 704	Food preparation and food safety	2.9	0.0	+1.5	0.0
703	Food consumption	3.6	0.0	-0.5	+1.2
708	Human nutritional well-being	4.7	0.0	-1.0	+2.5
	TOTAL	11.2	0.0	0.0	+3.7

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Tabulation and analysis of data and reporting of results from the 1965-66 Nationwide Food Consumption Survey will be a major activity through Fiscal Years 1968 and 1969. Further analysis will be made of dietary levels of low-income families surveyed in Mississippi in May 1967. Other studies of dietary levels of low-income families will be undertaken as needs develop.

Analyses will be made of vitamins B_6 and B_{12}, pantothenic acid and cholesterol levels in the national food supply. The Type A school lunch pattern will be evaluated using data from the nationwide study of nutrient content of Type A lunches. Revision of the food budgets will be undertaken when 4-season data from the 1965-66 food consumption survey are available. A revision of publications for applied nutrition programs will be initiated.

Major attention will be given to studies needed for updating Agriculture Handbook No. 8, "Composition of Foods...Raw, Processed, Prepared," and Home Economics Research Report 4, "Amino Acid Content of Foods," with special emphasis on dairy, poultry, and cereal products and on staple foods and formulated food products used to supplement food supplies in developing countries. Compilation of data will be initiated for tocopherols, and will be resumed for sodium and potassium in foods.

Increased emphasis will be given to studies of the forms in which nutrients occur and their properties. Studies will be undertaken of the lipid constituents such as sterols that accompany phospholipids and fats in foods. Methods for hydrolysis of protein foods will be studied for their effect on validity of amino acid analyses. Improved procedures will be developed for determining trace minerals.

Increased effort will be given to study of flavor and texture of food products. Initial studies of flavor will be on beef and lamb; studies on factors responsible for meat texture will be made. Studies of food preferences as related to taste and odor thresholds will be initiated.

In nutrition studies the influence of dietary fat and/or carbohydrate on metabolic processes involved in the utilization of these nutrients will be investigated using radioactive tracers and different strains of rats.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Research is needed to improve procedures for safeguarding the wholesomeness and eating quality of raw and cooked foods after they reach the consumer in homes and institutions. Expand research designed to assure the safety and satisfaction of meals in quantity food service. (AAP, HC)

Action--Studies have been initiated to modify glycolytic activity and fatty acid synthesis in Staphylococcus aureus. Such modification of metabolic pathways can inhibit both bacterial growth and toxin production.

Expand the scope of the work to include information on the effects on nutrients of developments in production, processing, marketing, and domestic and commercial preparation of foods. (NCU, AAP, HC)

Action--A special study of data in the literature on the effects of freezing on the content of nutrients has been initiated. Special attention is being given to reports in the literature on technological developments in preservation and institutional preparation of foods.

Continue and expand the search of the literature and other sources for data on the nutritive value of foods. (NCU, AAP, GF, HC)

Action--A literature search has been brought up-to-date for data on two amino acids, phenylalanine and tyrosine, in fruits and vegetables; and for data on three B vitamins, pantothenic, vitamins B_6 and B_{12} in foods of all groups where these vitamins occur. Search for information on other nutrients in foods is progressing.

Determine where important gaps occur in information on the nutritive value of food and provide guidance for studies to supply the information needed. (NCU, AAP) Give special attention to poultry, meat, and dairy products (NCU, AAP) and commercial cereal products. (GF)

Action--Initiated a study of relationships among nutrients in milk and the changes that occur when milk of known composition is made into specific dairy products, including certain cheeses, wheys, and cream. The study was planned to provide data on the nutritive values for selected dairy products that were omitted from Handbook No. 8 for lack of adequate information and to serve as a basis for revising values for important nutrients in other dairy products.

A general plan of work has been developed for a research contract to provide data on the yields and nutritive values of different classes of turkeys--raw and cooked--and on changes in yields and content of nutrients that occur in turkeys over the wide range in which they are marketed for home and institutional feeding.

Study the diets and nutriture of preadolescent children. (AAP, HC)

Action--Information was obtained on heights and weights of children of low-income families in two Mississippi counties.

Investigate environmental and social factors that influence children's food habits. (AAP, HC)

Action--None

Expand basic research on the significance of intake of fats from different food sources as affected by other dietary components to provide increased evaluation of the roles of hormone status, environmental stress, and physiological functions. Give high priority to an expansion of research to determine the biochemical mechanisms of fat and cholesterol synthesis and breakdown, and the associated physiological change. (NCU, AAP)

Action--Studies are planned to obtain more information on the biochemical mechanisms of fat and cholesterol synthesis and breakdown.

Basic information is needed to define the availability to man of carbohydrates, amino acids, minerals, and other nutrients in cereal foods. A far more complete determination is needed of the type of protein, protein level, and amino acid content of cereals, oilseeds, meat, milk and eggs. Improve analytical methods for nutrients so that data will better reflect their nutritional usefulness. (NCU, URD, GF)

Action--The program is being redirected to give greater emphasis on the identity and measurement of biologically available forms of nutrients. Basic research is planned to establish a standard condition of hydrolysis of proteins for use in amino acid analyses of various types of foods.

4. New or Additional Research Needs of Highest Priority

Fatty Acids in Foods. Studies suggesting a relationship between the type of dietary fat and health are continually underscoring the need for better data on the fatty acid content of foods. In the 10 years since the present tables of fatty acid content of foods were prepared, marked changes have occurred in the fat components of many processed foods. Also during this period new and more specific analytical methods for determining fatty acids have been developed. The present tables on the fatty acid content of foods need to be revised to reflect changes in food processing and analysis and expanded to make data available for much broader coverage of food items.

B-vitamin Loss During Food Processing and Handling. Studies are needed to provide accurate information of vitamin values of food as consumed. Little work has been done on the effects of various processing, storage, or food preparation factors on pyridoxine, vitamin B_{12}, folic acid, biotin, and other B-vitamins. There is need for a complete profile of changes in these nutrients through the various processing stages, storage intervals, and cooking procedures for different food commodities.

Taste Perception and Thresholds as Related to Food Acceptance and Preference. Research should be initiated on the extent and manner by which biochemical and physical qualities of food affect sensory responses of people and through these determine the acceptability of foods and the establishment of food likes and dietary habits. These factors are basic to prediction and improvement of acceptability of new food combinations and forms. Little is known about the relationship of taste perception of individuals to their preferences or prejudices for foods. Threshold sensitivities for basic tastes are known to decrease with age and to show genetic variance. The sequence and combination in which foods are eaten also affect taste and flavor responses and may play an important part in response to new taste experiences and food combinations.

Interaction of Nutrients on Mineral Metabolism. There is a need to expand research on mineral metabolism to obtain information on the effects of non-mineral dietary components on absorption, excretion, and retention of calcium, magnesium, and phosphorus. Retention of minerals in body tissues may be adversely affected by certain fat-carbohydrate combinations in the diet. For example, kidneys from BHE rats fed diets containing sucrose were higher in both calcium and magnesium than when the diets contained starch. This retention may lead to health problems and a shortened lifespan. These findings point out the need for increased research on dietary factors which influence mineral metabolism in order to recommend food and food combinations which can assure improved human nutritional well-being.

Diets and Nutriture of Preadolescent Children in Low- and Middle-income Families. Little information is available on the diets and nutriture of children during the period immediately preceding adolescence. This preadolescent period is important in determining the food habits and nutritional status of adolescents. Using experience gained in the research now being done in pre-school children in Hawaii, diets and nutritional status of 9- to 12-year old boys and girls in families with low and moderate incomes should be studied on a nationwide basis. Sufficient information on socioeconomic and food management practices of the families of these children and on related factors that predispose to good and poor nutrition should be obtained to point up conditions that most require correction.

Understanding of Environmental and Social Factors that Influence the Formation, Maintenance and Modification of Children's Food Habits. Lack of fundamental facts about the basis for food choices and for persistence or change in food practices has prevented full effectiveness of current efforts in nutritional guidance of children and families. The many different factors that affect a child's food habits should be identified and described and relative strengths in the dynamic interactions that result should be defined and quantified where possible. The Federally-financed child feeding program would provide situations where the components of food habits could be studied systematically. Data would be obtained on interrelationships of (1) food availability at home and at school, (2) foods and forms of food known to the child, (3) foods acceptable to the child, and (4) foods acceptable to the mother. A number of hypotheses would be developed and tested. The results would help in identifying those to whom guidance materials should be directed and the content of the materials.

Dairy Utilization - FOOD
Eastern Utilization Research and Development Division, ARS

1. Program Changes in Fiscal Year 1968

No.	Problem Area: Title and Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base: Intramural	F.Y. 1967 Base: Extramural	Changes in F.Y. 1968: Intramural	Changes in F.Y. 1968: Extramural
410	New and improved meat and milk products				
	Chemical composition, physical properties and structure	25.9	1.6		
	Flavor	9.9	2.4		
	Color, texture and other quality factors	3.0	1.5		
	Microbiology and toxicology	1.0	0.1		
	Technology-process and product development	14.0	1.0		
	Subtotal	53.8	6.6		
601	Expansion of foreign markets for U.S. farm products				
	Technology-process and product development	0.0	0.0		
	Subtotal	0.0	0.0		
702	Protect food supplies from harmful microorganisms and naturally occurring toxins				
	Technology-process and product development	1.5	0.0		
	Subtotal	1.5	0.0		
	TOTAL	55.3	6.6		

Domestic program is supplemented by PL-480 funds in 10 countries totaling 1,000,000 U.S. dollars equivalent.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969.

Current funds used to add additional man power (0.5 SMY) to research on spores.

Additional man power (1.5 SMY) added to whey-soy product research (products for foreign markets), taken from process and product development.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation.

Greater emphasis should be given to basic biochemical research on bacterial spores to elucidate the mechanism of spore dormancy and spore germination which would make possible lowering the degree of exposure to heat during processing resulting in a corresponding increase in the quality of sterilized milks and other foods. (AAP)

Attention is again drawn to the question of heat resistance of spores in processed foods and food ingredients. The presence of spores in many processed foods limits their utility and marketability. A concerted attempt should be made to find methods for destroying spores at lower critical temperatures. A breakthrough on this problem would do much to enhance the shelf life, flavor and marketability of many food products now of limited merchantable quality. (URD)

Action -- Increased emphasis was given to spore research by employment of one post-doctoral microbiologist for a one-year period (from base funds).

If additional resources become available under proposed plans, the effort on developing procedures to destroy spores in liquid milk concentrates would be increased.

An expanded program is recommended of research on growth, survival and death of selected Salmonella types in various dairy products under varied environmental conditions including research on the effects of temperature, humidity, pH, salts, sugars, and other ingredients of dairy products. Research should be done on development of processing procedures designed to eliminate all possible sources of contamination of dairy products and on development of ways to destroy pathogenic organisms which may be present in packaged products. Performance tests under pilot and industrial conditions to establish effectiveness of the developed methods should be made. (AAP) Of particular and immediate concern is the elimination of contamination by Salmonallae which currently confronts many segments of the food industry. Research is needed on the growth, survival and death of selected Salmonellae types under a variety of conditions of temperature, humidity and hydrogen ion concentration in foods. Special attention should be given to processing procedures designed to reduce contamination and destroy microorganisms which may be present in finished dried products. (URD)

Action -- 0.5 SMY shifted from low-fat cheese research to Salmonella program. Research on cottage cheese indicates the organisms are destroyed during high acid cooking of the curd. If additional resources become available under proposed plans, research on methods of safeguarding dairy products against Salmonellae contamination would be implemented.

The Committee recognizes development of a flavor-stable beverage quality instant whole milk powder as a prime goal toward which substantial progress has been made and recommends that all avenues of research, evaluation, and development leading to commercial acceptance be vigorously pursued and that adequate time and funds be provided to complete this project. Research is needed on improved gas-tight packaging. (AAP)

Action -- Sufficient funds are being made available to provide a supply of vacuum foam process dry whole milk for evaluation. A market test to be conducted by Economic Research Service is planned. Developmental work continues on dry whole milk made by the spray-foam process.

Contract research was initiated at Michigan State University to study the heat transfer in powdered milk.

Because of the increasing centralization of whey production, enactment of more stream antipollution laws, and present utilization of only about half of the 18 billion pounds of whey produced each year, further utilization research on whey is urgently needed. Such research should include cost reduction in concentrating and drying methods and development of new food uses. (AAP) Utilization research has a responsibility for the development of many food and feed handling and manufacturing processes, some of which inevitably lead to the production of waste products which may pollute land, air, or bodies of water. It has the obligation to develop as complete a use as possible of all components of the starting materials,

including recovery of by-products, in order to prevent waste and avoid pollution, and these factors must be a part of the evaluation of new processes. Constant reappraisal of existing processes should be an integral part of the utilization research programs, not only for profitable recovery of waste products, but also for abatement of pollution. (URD)

It is strongly recommended that processing methods be developed to provide new protein products with improved food quality at reduced cost. Serious effort must be devoted to methods which improve the acceptability of these products as food ingredients and enhance their nutritional value. Research is in progress on the conversion of soybeans to food products that will be acceptable to people in protein-deficient countries. This work has already resulted in a superior full-fat flour for use in infant feeding. Because the need is urgent, more rapid progress in developing nutritious and palatable soy foods should be made. (URD)

Action -- Whey-soy product research was made possible by a shift of resources (1.5 SMY) from product and process development. A newly developed product is undergoing foreign testing.

A division task group was formed to consider all aspects of use of whey and to make recommendations for research needs to bring about effective utilization of whey. If additional resources become available under proposed plans, research on new foods based on whey will be augmented.

It is recommended that greater effort be devoted to fundamental studies of the biology and chemistry of important agricultural products in order to increase our detailed understanding of them and thereby bring to light new ideas for their utilization. For example, more knowledge is needed of the factors which cause physico-chemical changes in proteins such as gel formation, heat coagulation, etc. (URD)

There is a strong need for more work dealing with the behavior of dairy ingredients (natural or modified) in processed foods, dry mixes, bakery products and confectionery items. Milk components behave quite differently in association with nondairy ingredients than they do in their native system. Such behavior or interactions must be understood so that broader applications of milk ingredients can be made possible in modern food technology. Increased attention is being directed toward enzyme systems in dairy products. Isolation, purification and assay techniques appear to be lacking and there is evidence that enzyme systems play a part in flavor changes of some stored dairy products. A modest program of investigations in this area appears to be warranted. (URD)

Action -- EU has a large continuing program of fundamental research on the milk proteins, which include enzymes. The general aim of this protein research is to identify the significant milk proteins, to describe them with respect to composition and molecular-structure, and to correlate the compositional and structural characteristics with such factors as chemical and enzymatic activity and with micelle formation and other expressions of molecular aggregation such as heat coagulation and gel formation. This information provides the base for developing or improving processes and products in which milk proteins are involved. A grant project on the milk enzyme system, lactose synthetase, is being negotiated.

Flavor is one of the most important attributes of milk and milk products and greatly influences their utilization. There is a dearth of information on the nature of desirable milk and milk product flavors as well as on undesirable flavors which may occur naturally or develop during storage. Research should be pushed forward as rapidly as possible toward solution of these problems. (AAP) The programs of the Department are yielding very useful information on the natural and "off" flavors that occur in milk and certain milk products. The work should be greatly expanded in the fields of evaporated and other sterile milks as well as in dry milks. The problems appear to be most critical in the area of flavor preservation during storage and distribution. It is felt that this problem may become more critical in the years ahead when milk production and processing may become concentrated in areas quite distant from the centers of population. (URD)

Action -- If additional resources become available under proposed plans, research on milk flavor would be expanded by 5 SMY's in new facilities in the Wyndmoor, Pa., laboratories of EU. Initial emphasis would be on the flavor significance of already identified volatile compounds of milk and on the contribution of proteins to flavor defects in processed milks.

Develop a continuous cheesemaking procedure by expanding basic and applied research on milk coagulation, curd formation, and flavor improvement. While substantial progress has been made in development of a low-fat cheese, research should be continued to improve the stability of this product to meet the needs of commercial distribution. (AAP)

With the growing popularity of cheeses in the American diet, continued work on cheese products is definitely warranted. The low-fat cheese recently developed by the Department is an excellent example of product development with far-reaching implications. (URD)

Action -- If additional resources become available under proposed plans, research effort on improved methods for continuous production of cheese will be expanded.

Basic and applied research on milk fat and its fractions should be expanded with emphasis on flavor stability, physical properties, and suitabilities for specific food uses. (AAP)

Action -- Newly begun investigations concern the fat associated with the caseins, and the constitution of the milk fat globule membrane both in normal and homogenized milk. Research on the fractionation of milk fat has continued. The development of specific food uses, including products prepared by cooperation of industry, has provided encouraging results.

4. New or Additional Research Needs of Highest Priority.

Sterilization of Dairy Products by Microwave Heating. The microwave portion of the electromagnetic spectrum is a region that should be systematically explored as a potential source of energy for sterilization. Somewhere within the broad latitude of this region there may be specific frequencies or wavelengths which will interact or be absorbed by vital cell constituents destroying bacteria without grossly affecting the surrounding medium. Microwave heating or structural disruption may be possible on the basis of the unique physical and chemical structure of spores.

Meat Utilization - FOOD

Eastern Utilization Research and Development Division, ARS

1. Program Changes in Fiscal Year 1968

Problem Area		Scientist Man-Years (Estimated)			
		F.Y. 1967 Base		Changes in F.Y.1968	
No.	Title and Activity	Intra-mural	Extra-mural	Intra-mural	Extra-mural
410	New and improved meat and milk products				
	Chemical composition, physical properties and structure	3.2	1.0		
	Flavor	4.0			
	Color, texture and other quality factors	4.5	1.2		
	Microbiology and toxicology	4.5	1.2		
	Technology--process and product development	3.0	2.9		
	Subtotal	19.2	6.3		
702	Protect food supplies from harmful microorganisms and naturally occurring toxins				
	Microbiology and toxicology		0.5		
	Subtotal		0.5		
	Total	19.2	6.8		

Domestic program is supplemented by PL-480 funds in 5 countries totaling 340,000 U.S. dollars equivalent.

2. Plans for changes in Use of Current Resources through Fiscal Year 1969.
No change in emphasis is planned.

3. 1966-67 Advisory Committee Recommendation and Extent of Implementation.
New methods should be developed for detection and control of microorganisms of public health significance such as Staphylococcus, Salmonella and spore-forming microorganisms in meats and meat products. Methods are needed which will preserve the naturally fine qualities of meat and meat products while assuring wholesomeness for institutional and home consumption. (AAP)

Of particular and immediate concern is the elimination of contamination by Salmonellae which currently confronts many segments of the food industry. Research is needed on the growth, survival and death of selected Salmonella types under a variety of conditions of temperature, humidity and hydrogen ion concentration in foods. (URD)

Research to safeguard the quality of meat products should be expanded. The relationship of processing techniques to microbial growth encompasses numerous variables. Current studies represent only a fraction of the effort needed to

provide basic information regarding microorganisms that endanger products with widely different characteristics and components now being produced, shipped, and stored in ever-widening market channels. Another phase of research should be devoted to studies of natural inhibitory substances in meat products and their effects on the viability, infectivity, toxigenicity, and pathogenicity of selected microorganisms. (AAP)

Action -- Research on growth of Staphylococcus aureus and food poisoning clostridia in meat was initiated under a grant at University of California, Davis, California.

By a shift of funds one senior scientist and an assistant have been assigned to a new project on Salmonellae in meat products at Beltsville. The work, which is just getting underway, will be concerned with the survival of Salmonellae in meat products and with methods for their detection. If additional resources become available under proposed plans, an additional effort of 2 SMY's would be applied to research to safeguard the quality of meat products.

A detailed knowledge of the chemical composition and physical properties of processed foods, and the raw materials from which they are made, is essential to the development of new and improved processed products and to the improvement of processing technology. Research should be continued on major and minor components, their structure and properties, and changes that occur during processing. A far more complete determination is needed of types of protein, protein level, and amino acid content for these raw materials, particularly the differences that may exist in different cuts of meat within the same carcass and from carcass to carcass within the same species. (URD)

Action -- Present effort continued.

Basic and applied research is needed to develop effective methods for extending the shelf life of packaged meats and meat products. Such research is needed to enable the meat industry to make intelligent choices among methods which would improve the economics of meat distribution and provide better products for consumers. (AAP)

Recently there has been considerable interest in centralized meatcutting and packaging. Present estimates indicate that these centralized operations would require time in distribution channels beyond the normal shelf life of the product. Research is needed on methods of pasteurization and pigment stabilization which would extend the shelf life of retail packages to 10 to 12 days without detracting from meat quality. A certain amount of basic research should be part of this project since many sources of variables in the shelf life of a prepackaged meat are still a mystery. For example, it is often observed that some meats with very high microbial counts are organoleptically quite sound while others with relatively low counts may be unpalatable. Research in the bacterial ecology of prepackaged meats has not been sufficiently rigorous to explain this anomaly. (AAP, URD)

Action -- A Division task group has been formed to study this problem and will report shortly. New research identified by the task group will require new funding for implementation.

Investigations currently underway relating to the flavor of meat should be expanded. The chemical components which collectively determine aroma and flavor are being identified. The results of these studies might at some future time permit the enhancement of quality of meats deficient in flavor. (URD)

There are many unanswered questions concerning the influence of packaging, storing and processing meat on its flavor characteristics. Additional investigations are urgently needed to determine the factors responsible for "warmed-over" flavors which characterize so many precooked convenience foods. (URD)

Action -- None.

Pre-rigor meat binds moisture and fat more effectively than chilled or frozen meat. It would be valuable to determine the factors responsible for imparting this characteristic to meats. This information would be useful in efforts designed to preserve or impart this particular desirable characteristic in some chilled meats used in fabricating products. More information is necessary on the chemistry of pork and beef muscle pigments from the standpoint of imparting the most desirable color to both fresh and cured meats. Information is lacking on the quantitative aspects of the reactive pigments. (URD)

Action -- Contract research was initiated at Pennsylvania State University on new fabricated products for increased meat utilization including new lamb and mutton products.

4. New or Additional Research Needs of Highest Priority.

New research is needed to develop methods for producing carcass meat with surface microbial loads of the order of ten organisms/square centimeter. Such meats are needed if longer shelf life in packaged meats is to be achieved. Methods for pasteurizing or cleaning carcasses after evisceration and for preventing their recontamination must be developed. Cooperative research with other agencies of ARS should be planned to test such meats in distribution channels.

Engineering studies should be conducted to provide meat products in new forms of texture, flavor and convenience. This research should include studies to develop new dehydrated meat products produced by explosive-puffing dehydration, and by other methods having a potential application in meat processing.

Animal Fat Utilization
Eastern Utilization Research and Development Division, ARS

1. Program Changes in Fiscal Year 1968

No.: Problem Area: Title and Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base: Intramural	Extramural	Changes in F.Y. 1968: Intramural	Extramural
411 New and improved products from wool, hides, skins and animal fats				
Industrial products				
Chemical composition, physical properties and structure	9.0	1.7		
Chemical and physical investigations to improve products	25.3	3.1		
Subtotal	34.3	4.8		
409 Production of animal products with improved consumer acceptability				
Food				
Chemical and physical investigations to improve products	0.0	0.0		
Subtotal	0.0	0.0		
TOTAL	34.3	4.8		

Domestic program is supplemented by PL-480 funds in 4 countries totaling 275,000 U.S. dollars equivalent.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969.

No major changes are planned.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation.

The 4.5 billion pounds per year output of inedible animal fats is one of the important byproducts of the livestock industry. It is of major concern because during the past fifteen years production has doubled while use in soap declined by half. The most promising potential for increasing uses for inedible animal fats appears to lie in the further development of new chemicals which are useful in such large volume outlets as plastics, plasticizers, lubricants, lubricant additives and biodegradable detergents. Development of fat-based detergents with their superior biodegradability would be an important contribution to the solution of problems related to preservation of supplies of potable water. Research should be expanded to provide the information and background essential to development of new products for these market areas and public needs. (AAP,URD)

Action -- If additional resources become available under proposed plans, research effort on utilization of inedible animal fats will be expanded.

There is urgent need for research that will facilitate production of a larger amount of total U.S. animal fat as edible fat. Such a shift in production would increase the world food supply substantially and simultaneously increase the return to the livestock industry. This objective can be achieved by processing and handling animal fats so as to permit production of a greater proportion of edible tallow. Data are not available on which an estimate can be made as to how far this shift could be made without changes in the basic

methods for marketing beef such as development of central meat cutting operations. However, scientific foundations for such a production shift must be broadened in the areas of fat stability and chemical modification to produce animal fat products with improved physical properties. (AAP, URD)

Action -- If additional resources become available under proposed plans, research to develop modified edible animal fat products with improved properties will be initiated.

4. New or Additional Research Needs of Highest Priority

Recommendations under Item 3 have priority.

Hides and Leather Utilization
Eastern Utilization Research and Development Division, ARS

1. Program Changes in Fiscal Year 1968.

Problem Area		Scientist Man-Years (Estimated)			
		F.Y. 1967 Base		Changes in F.Y. 1968	
No.	Title and Activity	Intra-mural	Extra-mural	Intra-mural	Extra-mural
411	New and improved products from wool, hides, skins and animal fats				
	Chemical composition, physical properties and structure	10.7	1.6		
	Chemical and physical investigations to improve products	8.4	0.0		
	Technology-process and product development	3.5	0.0		
	Subtotal	22.6	1.6		
410	New and improved meat and milk products				
	Chemical composition, physical properties and structure	0.0	0.5		
	Technology-process and product development	2.5	0.0		
	Subtotal	2.5	0.5		
702	Protect food supplies from harmful microorganisms and naturally occurring toxins	0.0			
	Microbiology and toxicology	0.0			
	Subtotal	0.0			
	TOTAL	25.1	2.1		

Domestic program is supplemented by PL-480 funds in 4 countries totaling 450,000 U.S. dollars equivalent.

2. Plans for Changes in Use of Current Resources through Fiscal Year 1969.

Work on the characterization of lipids and their distribution within hides was concluded and the manpower assigned (a) to intensify effort on characterization of hide defects and development of procedure for minimizing the damaging effects; and (b) to initiate studies on the preservation of hides through pickling.

Conclusion of one phase of work in tanning with glutaraldehyde enabled the initiation of studies on reactive dyestuffs for production of colors fast to washing and dry cleaning.

Studies were initiated through transfer of base funds on the development of more rapid and precise methods for identification of Salmonellae in meat and bone meals.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation.

Emphasis should be continued on investigations of the dispersion and reconstitution of collagen fibers from the less desirable areas of hides and skins to create new

and nonconventional products especially for utilizing its mechanical and physical properties as matrix and structure in food application. (AAP) In view of the diminishing market for hides resulting from the inroad of synthetic products, new markets must be found through research on the dispersion and regeneration of collagen into nonconventional products. (URD)

Action -- Work on the physical chemistry of high molecular weight gelatins and their relation to collagen structure has been initiated under contract with Northwestern University; also the effort was intensified through employment of a summer trainee.

Physical, chemical and biological investigations on hides and skins need to be strengthened in order to develop information on the properties of collagen and the other components to permit their use in areas other than the traditional leather markets. (AAP)

Investigation of cuttings and edges of hides for the creation of new leather-like products with new features should be continued. (URD)

Action -- If additional resources become available under proposed plans, work in this area will be initiated.

There is a definite need for new research on engineering aspects of leather making and processing operations to improve the overall economics. (URD) Studies should be initiated on the engineering aspects of hide processing to evaluate equipment and to develop processing methods for dispersing collagen. (AAP)

Action -- If additional resources become available under proposed plans. work in this area will be initiated.

The handling of hides in foreign countries should be studied. Research to protect hides during storage and handling is most important to the future of leather and this should be emphasized. (URD)

Action -- The Foreign Agricultural Service, USDA, sponsored a mission from the hide industry which toured ports of import and reviewed with importers and tanners the condition of U.S. hides. FAS sponsored and supported the American leather exhibit at the Semaine du Cuir (world's largest leather fair) at Paris, France, in September 1967.

Investigations should be intensified on the elimination of hide defects with a view to improve the quality and uniformity of leather and on the development of new processing methods including studies on pickling, to obtain greater economies in leather production in order to enhance its competitive position with the growing body of substitutes. (AAP)

Action -- Studies on hide defects were strengthened through shift in base funds. Studies in pickling of hides were initiated through a shift in base funds.

The investigation on leather making should be extended from the standpoint of improving processes and cutting costs, such as has been achieved by glutaraldehyde tanning. Continued studies are recommended on the chemical modification of hide proteins to develop leathers with additional new and improved properties that will enhance the comfort and utility of footwear and leather articles. (AAP)

Action -- Work on chemical modification of hide proteins has been intensified by transfer of personnel from a completed phase of work on glutaraldehyde tanning.

Work on water repellent chemicals should be investigated for its potential value on leather products. (URD) The work on the addition of preformed polymers to leather to give new features should be increased. (URD)

Action -- If additional resources become available under proposed plans, work in this area will be implemented.

Knowledge of the basic chemical and physical structure and microscopic investigations of leather should be extended. (URD)

There are natural qualities of leather which are being imitated by synthetics. These should be clearly defined and attempts made to improve them through basic chemical and physical knowledge. (URD)

Laboratory review of synthetic materials should be extended to learn first-hand their attributes and determine whether natural leather can meet or exceed them. (URD)

Action -- Through cooperation with the Statistical Reporting Service a study has been undertaken under contract to evaluate consumer preferences in materials in shoes.

4. New or Additional Research Needs of Highest Priority.

Research should be intensified on the development of products that will create new and nonconventional outlets (including food uses) for hides and skins through dispersion and conversion of the collagen fiber structure; and on the chemical composition of hides and skins with investigations on the physical properties and dynamic behavior of hide substance and leather to discover new concepts and principles needed for the development of new products and processes.

Research efforts should be strengthened to develop improved properties in leather; such as: easy care, scuff resistance, nonbleeding colors, uniformity, and water proofness, that now make the new poromerics so attractive to the shoe manufacturer and consumer.

Research should also be initiated on the physical-chemical and engineering aspects of processing operations to develop new products and processes.

POULTRY AND EGG UTILIZATION
Western Utilization Research and
Development Division, ARS

1. Program Changes in Fiscal Year 1968

Activity (Research Problem Area 410)	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y.1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
FOOD				
POULTRY MEAT				
Flavor	3.5	-		
Color, texture, and other quality factors	3.4	0.5		
Technology - process and product development	2.4	0.7		
Subtotal	9.3	1.2		
EGGS				
Chemical composition and physical properties	3.0	1.0		
Microbiology and toxicology	7.3	1.0		
Subtotal	10.3	2.0		
Total	19.6	3.2		

Domestic program is supplemented by P.L. 480 funds in India amounting to 9,500 U.S. dollars equivalent per year.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969.

Research on egg pasteurization will continue at a slightly reduced level and the effort shifted to the investigation of ways to destroy Salmonella on raw poultry products (1.0 SMY).

Research will be initiated on the enzyme systems in the particulate bodies of muscle such as lysosomes and mitochondria in a further attempt to explain and later control the observed variations in toughness that occur in young turkeys and chicken (1.0 SMY).

Contract work will be concluded on: the modification of egg white to "build-in" new or better useful properties; and on the changes in eggs caused by potential pasteurizing agents (1.0 SMY).

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Improve all aspects of processing and handling poultry meat (URD)

Action -- Research that bears on processing is underway and increases in activity will be made as funds and facilities become available.

Make eggs more attractive in order to increase consumption (URD)

Action -- Personnel is being sought to increase studies in this area. Some personnel doing egg pasteurization work will soon be available for reassignment.

Automate egg processing equipment (URD)

Action -- Unable to activate along with other pressing problems.

Avoid recontamination of pasteurized egg products (URD)

Action -- Limited attention is being given to the recontamination problem in the egg pasteurization manual. Consideration will be given to specific studies.

Expand research on composition and properties of poultry and eggs (AAP)

Action -- Additional personnel are being sought.

Principles of processing and storing poultry and egg products (AAP)

Action -- Contract was placed to determine the fundamental emulsifying and binding properties of poultry meat and skin.

Basic and applied studies on poultry tenderness (AAP)

Action -- An additional worker will be added to determine the relation between tenderness and the enzyme activity in the lysosomes and mitochondria of muscle.

Relation between specific poultry constituents and organoleptic response (AAP)

Action -- Research workers are shifting their attention to this phase of the problem even though identification work is still being done.

Salmonella control in poultry and egg products (AAP)

Action -- Research on egg products is continuing and work on poultry products is being initiated.

4. New or Additional Research Needs of Highest Priority

Chemical Composition and Physical Properties. The rapidly changing poultry industry makes important use of fundamental information of poultry and eggs. Recent findings on the interaction of egg proteins that are of potential practical significance emphasize the importance of fundamental studies. Basic studies of chromogenic proteins may lead to an understanding of the sporadic occurrence of unnatural pink color in cooked products. Utilizing the most advanced scientific developments, research should be expanded on the composition and especially on the properties of components of poultry and eggs in order to provide a continuing sound basis for the development of new processes and products and for solving troublesome problems as they arise.

New and Improved Poultry and Egg Products. Added values available in ready-to-serve poultry- and egg-containing products of high quality whether cooked, frozen, canned, or dried help to sell and increase the return realized from poultry and eggs. An expanded research program on the major factors influencing quality, stability, wholesomeness, and processing costs is needed to assure maximum return. The program should include only a limited effort on formulation. Major emphasis should be placed on developing principles of processing and storing that would be widely applicable in the production of superior poultry meat and egg products and on the development of products that would be useful in formulation of other foods including emulsifying and binding properties of component parts. Studies are needed to define in chemical and physical terms the texture and other quality changes in poultry meat caused by processing such as canning, dehydration, and irradiation as a basis for developing superior products that can reach markets with little or no special handling.

Processing Poultry for Optimum Tenderness. Under present continuous-line processing procedures, optimum tenderness does not develop in poultry meat. The alternative, the use of long-time tenderizing periods, is inconvenient and costly. Obvious variations in processing treatments have failed to eliminate the need to age several types of poultry. In view of encouraging basic observations, studies of tenderness should be accelerated. Emphasis should be given to studies of the mechanism of tenderization and to ways the knowledge gained can be applied.

Flavor of Poultry Meat Products. Much of the frozen, dehydrated or otherwise processed poultry has varied widely both in natural poultry flavor and in development of off-flavor. A great deal of knowledge has resulted from research on poultry flavors at the Western Utilization Laboratory. The studies should be expanded to apply this information, to develop additional information, especially to develop a more exact relation between specific poultry constituents and organoleptic response. A special study should be made of the character of "warmed over" and "off" flavors because of the increasing production of prepared poultry products.

Improvement of Salmonella Destruction Treatments. While successful pasteurization of egg products is being practiced commercially, further specific studies should be conducted to thoroughly evaluate important physiological and environmental factors that influence the resistance of salmonellae to destruction in order to develop milder and less costly pasteurization treatments for all types of egg products. Research should be initiated to develop pasteurization treatments for poultry products. In both cases, studies are needed to determine the processing and control steps necessary to avoid cross contamination and postpasteurization contamination.

WOOL UTILIZATION
Western Utilization Research and
Development Division, ARS

1. Program Changes in Fiscal Year 1968

Activity (Research Problem Area 411)	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y.1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
FIBERS AND LEATHER				
Chemical and physical investigations to improve products	17.4	2.0		
Technology - process and product developments	7.0			
Total	24.4	2.0		

Domestic program is supplemented by P.L. 480 funds in 4 countries (India, Israel, Germany and Sweden) totaling approximately $70,000 equivalent per year.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969.

Improvements in shrinkproofing of wool top and fabric will be tested in mill trials. Increased emphasis will be placed on development of durable-press, 100% wool and wool/cellulosic blend fabrics. Exploratory work on electrical discharge treatments of wool will be extended to larger scale studies including the use of gaseous chlorine along with corona discharge (2.0 SMY).

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Woolen system (AAP, URD)

Action -- Limited exploratory work continued through purchase of services. Preliminary plans and estimates for construction of facilities for woolen system were prepared for budget consideration of new construction.

Blends of wool and modified wool with other fibers (AAP, URD)

Action -- Exploratory work started through purchase of specially constructed fabrics. New line project and contract proposal prepared for research to be carried out at Texas Technological Institute. In-house work on treatment of wool blend fabrics was expanded.

Basic research on wool and mohair properties (AAP, URD)

Action -- Continued study of chemical and physical properties of wool included research on causes of yellowing by light and heat, mechanism of grafting of polymers to wool, critical surface energy requirements for soil resistance, as well as better understanding of fiber structure in relation to fiber mechanics.

Modified wools and mohair (AAP, URD)

Action -- Research contract initiated on new fluorochemical finishes for wool and mohair textiles. In-house research on new textile finishes is continuing with special emphasis on fluorosilicon finishes.

Basic studies of construction factors in wool knits (URD)

Action -- Interrelationships of yarn friction, machine settings, and other knitting parameters were critically studied; reports were presented at 2 international and 2 national technical conferences.

Resistance of wool to insects and microbes (URD)

Action -- None pending further development of new halo-chemical finishes.

Mohair processing to eliminate Kemp Fibers (URD)

Action -- None; time and facilities did not permit.

4. New or Additional Research Needs of Highest Priority

Durable Press. Durable press garments are of great importance to consumers because wool and mohair products that require little or no pressing would provide substantial savings in apparel upkeep and service costs. Research should be greatly expanded toward development of superior durable press wool and mohair apparels through new chemical treatments and scientifically designed woolen and worsted fabric structures.

Chemical and Physical Properties and Structure of Wool and Mohair. Information is inadequate on the chemical breakdown occurring in the proteins of wool and mohair as a result of exposure to heat, light, and chemicals. Knowledge is also lacking on the nature and location of reactive centers in the wool molecules. Research should be expanded on the chemical processes involved in wool and mohair degradation and on the nature and location of active centers to which modifying chemicals might be attached to create chemically modified fabrics.

Woolen System. The facilities in the Wool Processing Laboratory are limited to the worsted system of fabric manufacture. The manufacture of woolen fabrics presents unique problems in blending, carding, spinning and finishing problems which are not receiving attention at present. Research on mechanical processing should be expanded to include the woolen system of processing domestic wools, including wools that have been physically and chemically modified.

Chemical Reagents and Physical Conditions of Setting Reactions. Reagents and treatments modify the physical dimensions and resistance to deformation of wool fabrics. Basic studies should be expanded on effects of chemical reagents and physical conditions that affect the setting and wrinkle recovery of wool fabrics.

Grafting of Polymers on Wool Fibers. Recent research under contract has shown that it is possible to obtain thermoplastic, highly elastic fibers through the formation of soft polymers within the wool fiber. This important research finding should be followed up with further in-house research and development as soon as needed equipment can be installed.

Optimum Use of Wool and Non-Wool Fibers and Blends. One reason for the rapid expansion of markets for synthetic fibers has been the judicious use of fibers with special characteristics in blends to make improved fabrics, especially durable press fabrics. The possibility should be investigated that chemically modified wools could be substituted for the high percentage of synthetic fibers now used in wool-synthetic blends, or be used with other fibers to produce superior fabrics.

III. MARKETING AND ECONOMIC RESEARCH

MARKET QUALITY - ANIMAL PRODUCTS
Market Quality Research Division, ARS

1. Program Changes in Fiscal Year 1968

No.	Problem Area: Title and Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base: Intramural	F.Y. 1967 Base: Extramural	Changes in F.Y. 1968: Intramural	Changes in F.Y. 1968: Extramural
412	Quality maintenance in marketing animal products				
	Meat	1.0			
	Poultry and Eggs	1.0			
	Subtotal	2.0			
501	Improvement of grades and standards				
	Meat	4.0	1.9		+ 1.0
	Dairy Products	1.0		+ 1.0	
	Wool		1.0		0.5
	Subtotal	5.0	2.9	+ 1.0	+ 1.5
702	Protect food supplies				
	Poultry	1.0	0.8		
	Subtotal	1.0	0.8		
707	Prevent transmission of animal diseases to people				
	Meat		1.0		
	Poultry and Eggs	2.0			+ 1.0
	Subtotal	2.0	1.0		+ 1.0
	TOTAL	10.0	4.7	+ 1.0	+ 2.5

Domestic program is supplemented by PL 480 funds in 3 countries totaling 35,396 U. S. dollars equivalent

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

No changes in emphasis of the work are expected through FY 1968.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

DAIRY PRODUCTS

Market Quality of Fluid Milk. Information is needed on (1) the effect of the ultrahigh temperature extremely short-time pasteurization procedures on flavor and other quality attributes of milk during the time it is in storage and channels of distribution, and (2) on the numbers and kinds of microorganisms in milk marketed under these newly created conditions.

Action -- None.

POULTRY AND EGGS

Salmonella in Eggs, Poultry and Poultry Products. Investigations are needed to determine under what conditions salmonellae proliferate in poultry, eggs and in egg and poultry products during handling, storage and distribution.

Action -- Research is continuing to develop methodology of testing for Salmonella in poultry products. An agreement has been negotiated with the Agricultural Experiment Station, University of Delaware, on research on the problem of determining the relationship of processing and marketing practices to the incidence of salmonellae on ready-to-cook broiler chickens.

Quality Maintenance of Eviscerated Poultry. Research should be continued to determine the effects of various existing methods (as well as new or improved methods) of slaughtering, scalding, defeathering, eviscerating, chilling, packaging, transporting, and holding on the quality of eviscerated chickens and turkeys. Factors such as appearance, shelf-life, flavor, tenderness and wholesomeness as affected by various processing techniques should be studied. Basic research to elucidate the physiological, chemical and physical processes involved in the maintenance of poultry meat quality should be an integral part of this study.

Action -- Current research will continue.

Wholesomeness of Poultry. Immediate research is needed to establish whether or not the wholesomeness of an entire bird is affected when small evidences of leukosis on the skin or internal organs are visible.

Action -- The Animal Husbandry Research Division has undertaken research in this area.

LIVESTOCK, MEAT AND WOOL

Measurement of Market Quality. Research is needed to provide improved methods of quantitative and qualitative evaluation of both live animals and dressed meat. There is need to develop accurate methods of measuring the ratio of lean muscle mass to fat tissue.

Action -- Current research will continue.

Shelf-Life of Fresh Meat. Additional research is needed to increase the shelf-life of fresh meats in retail markets in addition to the research already conducted on refrigeration, sanitation, and lighting.

Action -- A cooperative research agreement was initiated with Oklahoma Agricultural Experiment Station providing for the identification of post-mortem changes in the functional properties of bovine muscle proteins and their relationship to the market quality of block beef.

Standards of Meat Grades. Additional research is needed to provide better methods for determining more meaningful meat grade standards. Present standards provide for grading beef from steers, heifers, and cows without sex identification. Beef from bulls and stags is graded as bull beef and stag beef, respectively, and identified for class as "bull beef" or "stag beef." At present, the quality in a designated grade of bull beef (and stag

beef) is not comparable with a similarly designated grade of beef from steer (heifer and cow). It is recommended that this problem be brought to the attention of the Grading Service of the Livestock Division, C&MS, for early consideration and inclusion in grade standards and specifications.

Action -- A cooperative research agreement on bulls was continued with the University of Florida, Institute of Food and Agricultural Sciences, Agricultural Experiment Station, Department of Animal Science, for studies to determine the relationship of chronological age, physiological age, and carcass quality characteristics, and the effect of quality characteristics of bulls, steers and heifers of the same genetic background on the palatability of bovine meat.

Objective Measurement of Wool Quality. Improvement of present methods for measuring quality factors of the wool fiber would contribute to the development of better grading procedures that would be more closely related to processing performance and product quality. Technical comments from mills would be helpful.

Action -- The existing research contract at the University of Wyoming was broadened to include development of methods to objectively evaluate wool fineness and softness by using such techniques as the Coulter Counter.

Standards for Mohair Classification. Mohair standards are needed. A set of standards for mohair classification should be established including measurement of fiber length, density, fineness and character.

Action -- None.

4. New or Additional Research Needs of Highest Priority

Salmonella in Milk and Other Dairy Products. Salmonella, even at very low levels, present a potential health hazard in dairy products. More research is needed on the occurrence of Salmonella in dairy products with particular emphasis on sources of contamination and/or means of eliminating such contamination. Improved methods of detecting Salmonella in dairy products are needed. More information is needed on heat treatments required to kill Salmonella in dairy products.

Studies should be made of interactions of Salmonella with other non-pathogenic bacteria. Very small numbers of Salmonella are apparently harmless but may multiply to dangerous levels when a food is held under unfavorable conditions. The addition of harmless bacteria which will outgrow Salmonella might be a means of preventing the growth of Salmonella to harmful levels or causing the food to spoil before Salmonella could multiply to hazardous levels.

Heat Stability of Bacteria. Preliminary work has shown that bacteria apparently "killed" by heat may recover their ability to grow normally after a period of time. The extent of heat damage and recovery depends on the heating medium and the recovery medium. Little is known of the mechanism of heat damage to bacteria. This work is of fundamental importance to those concerned with reduction of bacterial loads in foods by heat processing and should be expanded to obtain more information about the nature of thermal injury and recovery of bacteria.

Salmonella in Poultry Products. Research is needed to ascertain the significance of various sources of salmonellae in market broilers and to develop practical means of controlling these sources. Such sources as the ranch environment (sanitation, presence of wild birds, rodents, and reptiles, etc.), feed and mill, hatchery and breeder ranch, and processing plant environment and facilities should be investigated. As a part of such a study, the feasibility of producing Salmonella-free market poultry via control of the sources should be determined.

Microbiological Condition of Poultry Products. Research should be expanded to develop improved procedures for evaluating the microbiological condition of poultry and egg products. Microorganisms of public health significance, Salmonella, Staphylococci, and Clostridia, should receive primary emphasis, but studies on spoilage microflora should also receive attention.

Quality of Raw Ingredients and Finished Poultry Products. Research should be undertaken to determine the relationship between quality of raw poultry and eggs and the quality of products processed or fabricated therefrom and to develop rapid, reliable objective methods for evaluating the quality of both raw and of "further processed" poultry products. Methods are needed for specific factors, such as shelf-life, degree of oxidative deterioration, degree of tenderness, moisture content, bone content, and presence of chemical residues and foreign bodies.

Shelf-Life of Fresh Meat. Additional research is needed to increase the shelf-life of fresh meats in retail markets. We need to develop improved procedures for determining and controlling spoilage and food poisoning

microorganisms associated with meat. We need to evaluate the effect of handling and shipping procedures on meat quality and to develop improved methods for detecting salmonellae and pesticide residues in meat.

STORED-PRODUCT INSECTS RESEARCH
Market Quality Research Division, ARS

1. Program Changes in Fiscal Year 1968

No.	Problem Area: Title and Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base: Intramural	F.Y. 1967 Base: Extramural	Changes in F.Y. 1968: Intramural	Changes in F.Y. 1968: Extramural
412	Quality maintenance in marketing animal products				
	Prevention of insect infestation in dairy products	1.0	0.8		- 0.5
	Nontoxic mothproofing of woolen fabrics	1.0	0.6		- 0.2
	Total	2.0	1.4		- 0.7

Domestic program is supplemented by P.L. 480 funds in 1 country totaling 4,290 U.S. dollars equivalent.

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

The sex attractant in the black carpet beetle has been identified and synthesized. Pheromone studies in other dermestid beetles will be initiated. As the synthetic black carpet beetle pheromone becomes available, its practical use as a control or for surveillance will be developed and evaluated by laboratory and field studies. Performance and possible additive action of isomers of the pheromone will be evaluated. Studies will be made on the relationships between Salmonella and dermestid beetles, supplemented by work under cooperative agreement if necessary. Significant progress has been made on the investigation of quaternary ammonium compounds as mothproofing treatments. Emphasis will now be shifted to other types of materials with low toxicity to warm-blooded animals. There will also be increased emphasis on the development of safe, effective mothproofing treatments for home use.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Research is needed on sources of Salmonella infection and factors involved in cross contamination in processing feeds and food products, in feed ingredients, and in litter for poultry. (AAP)

Action -- Research was initiated to learn more about the Salmonella infections in dermestid beetles of importance to the feed and dry milk industries, the significance of these infections, and their possible relationship to the spread of infections or cross contamination of food and feed.

A cooperative agreement was initiated with the University of Minnesota to study the bacteria occurring in the alimentary canals of the granary weevil and the lesser meal worm. The latter is often a pest in feed mills or stored animal feed, and is often abundant in poultry litter.

A cooperative agreement was initiated with the Kansas State University for research on the role of stored-product insects in distributing potentially hazardous micro-organisms and their byproducts in stored grains.

Particular emphasis should be placed on studies involving transmission of avian leukosis and on control by sanitation. (AAP)

Action -- The Market Quality and Entomology Research Divisions have jointly initiated a cooperative agreement with the University of Maryland on the biology and ecology of the lesser meal worm to obtain information that may lead to the development of new control procedures for preventing transmission of leukosis to chickens.

Modifications of wool are needed that impart permanent resistance to insect attack. (AAP)

Action -- None.

There is need for a new assessment of insect and mite problems in the dairy product industry. (AAP)

Action -- Preliminary and superficial observations on the current status of insect and mite problems in processing plants and storage areas for dairy products have been made.

There is urgent need for research on the effects of surfaces on the degradation of insecticidal deposits. (AAP)

Action -- A cooperative agreement was initiated with the University of Wisconsin to study the mechanism and control of the adverse effect of certain surfaces on deposits of some insecticides commonly used in dairy-product plants and storage areas. This study represents only an initial attack on the overall problem.

Expand research on nontoxic mothproofing treatments and on safer, more effective measures against fabric insects in homes and commercial establishments. (AAP)

Action -- Research on developing nontoxic mothproofing treatments continued at the same level. In addition, the program of evaluating the performance of new compounds, where the manpower is charged to another area of research, was directed toward finding new safer, more effective materials that might be used against fabric insects. The black carpet beetle is one of the insects used in these evaluation tests.

4. New or Additional Research Needs of Highest Priority.

Salmonella Transmission by Insects. Increased research is urgently needed to determine as soon as possible the role of insects in the transmission of Salmonella to food and feed. Where direct relationships are found, there must be a prompt, intensive effort directed toward finding ways to break the links in the chain of transmission.

Insects Attacking Dairy Products. There is need for a current determination of the kinds of insects and mites that are of importance where dairy products are manufactured, shipped, and stored. The research should also produce information on the distribution, abundance, and relative importance of the various species, as a guide for control recommendations and the nature of the research program directed to developing improved control measures.

Preventing Insect Damage to Woolens. The insects that attack woolens in the home are a major cause of losses by stored-product insects. They are abundant and occur throughout the entire country. The individual items they damage or ruin are often expensive. A report from State Extension workers shows that the number of requests for information on fabric-insect control leads all other insect inquiries in most states. Research should be expanded to develop safer, more effective mothproofing treatments that can be applied in the home and during the manufacture of woolens.

MARKETING FACILITIES, EQUIPMENT AND METHODS
Transportation and Facilities Research Division, ARS

1. Program Changes in Fiscal Year 1968

Activity (Research Problem Area 505)	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intramural	Extramural	Intramural	Extramural
Beef	1.4		-0.2	+0.3
Dairy	1.2			
Poultry	3.6	1.0		-0.2
Swine	0.4	0.4		+0.7
Cross Species	2.2	0.8	+0.2	-0.8
Totals	8.8	2.2	-	-

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

The research on developing electrically operated pen gates for livestock markets and on developing an automated system for driving and penning livestock will be completed and 0.2 SMY shifted to work to improve layouts and work methods for auction markets. In-house research on beef and veal boning lines will be continued at the current level. During the last half of fiscal year 1968, an additional 0.3 SMY of extramural resources is planned to initiate work on determining ways to recover edible meat now lost in the boning operation.

Research to increase operational efficiency in dairy plants through improving layouts and applying automated and highly mechanized procedures will be continued at the current level. The work consists of checking, revising, and preparing for Department publications a series of contract reports and research in both laboratory and commercial dairy plants to optimize the utilization of automation in fluid milk plants.

Research on improved designs and layouts for egg grading and packing plants will be completed by mid-year and 0.3 SMY will be shifted to developing methods and techniques to reduce shell egg breakage during handling and processing operations. Completion of research on development of methods and equipment for bath pasteurization of whole egg liquid conducted under agreement with the University of California will permit a shift of 0.2 SMY to meat yield studies by the University of California on experimental turkey deboning equipment being developed under research contract. Completion of research on developing improved methods and equipment for weighing and packing turkeys will permit shifting 0.1 SMY to initiate work on improving methods and equipment for eviscerating turkeys. Completion of research on improved designs for chicken processing plants and improving chicken processing efficiency by balancing eviscerating and inspection operations will permit shifting 0.2 SMY to initiate studies directed toward improving methods and equipment for slaughtering and defeathering chickens and reducing water consumption in chicken processing plants.

The research on prechill processing of pork products will be continued. The emphasis of this research through fiscal year 1969 will be on developing prototype equipment and a pilot "hot processing" line and on tests and modifications to make the system operational. Resources for "in-house" research will stay at the current level; however, an increase of 0.7 SMY of extramural resources is provided in the form of a Cooperative Agreement with the Nebraska Agricultural Experiment Station.

Research on hotel supply houses, slaughter plants, and handling sales data on livestock markets will be completed and the projects discontinued. The 0.5 SMY released by completing these projects will be used to accelerate research on small inedible rendering plants, including work on Salmonella control, and to initiate work to develop standards for container sizes for handling, storing, and shipping wool.

3. 1966-1967 Advisory Committee Recommendations and Extent of Implementation

Research is needed to develop egg handling methods and packing plant procedures for reducing shell egg damage. (AAP)

Action -- To be initiated at mid-year by shifting 0.3 SMY from research on improved egg grading plant layouts and designs being completed during fiscal year 1968.

Develop facilities, equipment, and/or methods for handling powdered egg and other poultry products to eliminate contamination hazards in handling and/or packaging finished products. (AAP)

Action -- None. No funds available.

Research is needed to evaluate methods for improving crew balance and to develop improved equipment for use in the turkey eviscerating operation. (AAP)

Action -- To be initiated during fiscal year 1968 by shifting 0.2 SMY from research on improving turkey packing operations and development of batch pasteurization methods for whole egg being completed during the year.

The Committee supports plans for continuing and expanding work on handling and bruising of live poultry. (AAP)

Action -- Funds not available to continue this research at fiscal year 1967 level. Support to be reduced 0.1 SMY.

Initiate work on water conservation in poultry processing plants and on processing engineering later in the year as other research projects are completed. (AAP)

Action -- Research on water conservation in poultry processing plants to be initiated during fiscal year 1968 by shifting 0.1 SMY from completed research on improved designs for poultry processing plants and 0.1 SMY from research on developing guidelines for balancing inspection and eviscerating operations being completed during the year.

Research should be continued on handling and processing "hot" pork products. (AAP)

Action -- A research agreement covering the design and testing of a chill cabinet, the design of a pilot line system for prechill processing, and testing of the system in a commercial packing plant was negotiated with the Nebraska Agricultural Experiment Station. Plans and specifications for a continuous-flow chill cabinet were prepared and provision for construction is underway.

Engineering research is needed to broaden and update previous work of the Branch on layouts and operating criteria for livestock auction markets. (AAP)

Action -- A research project covering this work was initiated in November 1966. Field studies and tabulation of data are underway.

Research is needed to develop an automated system for handling sales data on livestock markets. (AAP)

Action -- Research was initiated in May 1966. A research agreement to develop an automated system was negotiated with the Computer Research Center of the University of Missouri. The system has been installed on the Central Missouri Livestock Auction, Mexico, Mo., and "debugging" tests are underway.

Research should be continued on developing an automated system for driving and penning livestock. (AAP)

Action -- No further work is planned at this time due to lack of funds.

Research should be continued on developing electrically operated pen gates for livestock markets. (AAP)

Action -- This research has been completed and the results published. The prototype gates continue to operate satisfactorily.

Research should be continued on layouts and work methods for small inedible rendering plants. (AAP)

Action -- This research has been broadened to include work on Salmonella control. During fiscal year 1968 an additional 0.2 SMY will be shifted to this work due to completion of other projects.

The Committee does not recommend additional research on automation of small dairy plants. (AAP)

Action -- None

Engineering research is needed in wool warehouses to develop standards for container sizes for receiving wool and packages for handling, storage and shipping. (AAP)

Action -- Research on standards for wool containers to be initiated in fiscal year 1968 by shifting 0.3 SMY from work scheduled for completion on an automated system for handling sales data on livestock markets.

4. New or Additional Research Needs of Highest Priority

Retrieving Edible Meat Now Lost in Boning Operation

Develop nondestructive means for retrieving meat for human consumption that is now being processed, along with the bones, through rendering plants because it cannot be removed economically by conventional boning methods.

Post-processing Contamination of Poultry and Poultry Products

Develop facilities, equipment and/or methods for handling powdered egg and other poultry products to eliminate contamination hazards in handling and/or packaging finished products.

CONSUMER PACKAGES, SHIPPING CONTAINERS,
TRANSPORT EQUIPMENT AND TECHNIQUES
Transportation and Facilities Research Division, ARS

1. Program Changes in Fiscal Year 1968

No.	Problem Area Title and Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base Intramural	F.Y. 1967 Base Extramural	Changes in F.Y. 1968 Intramural	Changes in F.Y. 1968 Extramural
505	Packages and shipping containers for poultry and poultry products	0.7			
505	Packages and shipping containers for poultry shipped to overseas markets	0.4			
505	Transport equipment and techniques for animal and animal products	0.6	0.4	+ 1.1	- 0.4
505	Transport equipment and techniques for overseas shipment of:				
	Animal & animal products	0.7	0.4	+ 0.3	- 0.4
	Poultry & poultry products	1.4	0.4	- 0.4	- 0.4
	Total	3.8	1.2	+ 1.0	- 1.2

2. Plans for Changes in Use of Current Resources through Fiscal Year 1969

Analysis of data and reporting results from the F.Y. 1967 tests of polystyrene foam containers will be continued in F.Y. 1968. As this work is completed the use of CO_2 as an in-package refrigerant will be tested. Testing of less costly packages and shipping containers for frozen turkeys and poultry shipped in van containers to overseas markets will be continued and are scheduled for completion in F.Y. 1968.

With completion of building and laboratory testing of the prototype of the multipurpose van container, contract work under this project will be discontinued. Transport and handling tests of the van container will then be conducted in both domestic and overseas shipments. It is expected that work on overseas transport of frozen poultry will be continued at a slightly lower level. Completion of work on the handbook for transport of perishables will allow an increased level of research on air transport of meats.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Consumer Packages and Shipping Containers for Poultry. The committee feels there is need for further research on consumer packages and shipping containers for poultry and on the equipment used for handling products. Although this area of research was advised against last year, it is now felt that private industry is not meeting the need as expected in this area. (AAP)

Action -- Research work on developing and evaluating improved shipping containers for fresh dressed poultry was started in F.Y. 1967. A polystyrene foam box that would reduce average transport cost by 9.4¢ per 100 pounds of poultry was tested. Less costly packages and shipping containers to European markets were also tested. In F.Y. 1968 investigations on the use of CO_2 as an in-package refrigerant will be started and testing of less costly packages and shipping containers for frozen turkeys and poultry shipped in van containers to overseas markets will be continued.

Engineering research is needed in wool warehouses to develop standards for container sizes for receiving wool and packages for handling, storage and equipment. (AAP)

Action -- None.

Current work on multipurpose transport vehicles should be expanded, particularly the research on the compartment-type van for large shipments. (AAP, MR)

Action -- We are continuing this research. Interim information has been released in papers and articles and we are preparing an interim report.

Cryogenic Refrigeration and Atmosphere-Control Technology in Transport. Recent developments in the use of cryogenics for refrigeration and atmosphere-control technology have made it necessary for shippers, receivers, and transporters to choose among a large number of ways of protecting perishable food products in transport and handling. Lack of adequate cost and performance data for the new techniques makes it difficult to choose the best means of protecting products on the way to market. Research should be undertaken to develop economic-engineering data for more effective shipper decisions and to develop packages, shipping containers, transport equipment, and techniques that will improve the performance and lower the cost of cryogenic refrigeration and atmosphere-control methods. (MR)

Action -- In F.Y. 1968 we are conducting research to compare cost and performance of liquid nitrogen and mechanical refrigeration in local delivery of perishable foods.

Air Transport of Agricultural Products. Recent improvements in air transport have increased the opportunities to expand its use in marketing a number of agricultural perishables. These improvements include larger and faster planes with lower operating costs, and improved containerization and improved cargo handling methods. The speed of air transport and improved handling techniques should bring savings in packaging, handling, and refrigeration costs and reduce product and quality losses. Research should be undertaken to find ways to use this new technology to do a better job of transporting perishable farm products. (AAP, MR, HC)

Action -- We are doing exploratory work and planning a research program in air transport of perishables to be carried out when resources are available. We also have discussed with several officials of the air transport industry the possibility of industry matching funds and cooperation. We have been assured active cooperation by the industry.

Improved Coordination of Transport Services. Costs and efficiency in marketing agricultural and food products depend to a very large extent upon how effectively the transport requirements of the physical distribution system are met. Poor coordination of the services of the different transport modes lowers utilization rates for equipment and facilities, increases transport costs, and delays marketing and processing schedules. Research is needed to find ways to improve coordination of transport services for agricultural products and farm supplies. (HC, MR, GR)

Action -- Work has not begun on this recommendation.

4. New or Additional Research Needs of Highest Priority

Overseas Transport Research. Recent developments in transporting and handling of overseas products, such as containerization, afford an opportunity to get U. S. agricultural products to overseas markets in better condition and at lower cost than with present transport equipment and techniques. Work is needed to determine how and under what conditions these new techniques can be used for shipping and handling specific commodities to overseas markets to reap the most benefits from improvements. Work on developing improved transport equipment, techniques, packages and shipping containers for overseas shipments of U. S. agricultural products should be expanded.

Air Transport. Recent improvements in air transport have increased the opportunities to expand its use in marketing a number of agricultural perishables. These improvements include larger and faster planes, such as the new 747 and 727 QC all cargo jets with lower operating costs, containerization and improved cargo handling methods. The speed of air transport and improved handling techniques should bring savings in packaging, handling and refrigeration costs and reduce product and quality losses. Research should be undertaken to find ways to use this new technology to do a better job of transporting perishable farm products.

Improved Coordination of Transport Services. Costs and efficiency in marketing agricultural and food products depend to a large extent upon how effectively the transport requirements of the physical distribution system are met. Poor coordination of the services of the different transport modes lowers the utilization rates for equipment and facilities, increases transport costs, and delays marketing and processing schedules. Operations research techniques afford the means of determining the most efficient means of coordinating the services of the different transport modes to meet the needs of the marketing system. Research should be undertaken to find ways to improve coordination of transport services for agricultural products and farm supplies.

COOPERATIVE MARKETING
Specialized Cooperative Research Program, FCS

1. Program changes in Fiscal Year 1968

No.	Problem Area	Scientist Man-Years (Estimated) F.Y. 1967 Base: Intra-mural	F.Y. 1967 Base: Extra-mural	Changes in F.Y. 1968: Intra-mural	Changes in F.Y. 1968: Extra-mural
505	Physical and economic efficiency in marketing livestock	0.5	-	-0.5	-
509	Marketing firm and system efficiency	2.1	-	-1.1	-
510	Farmers bargaining power	1.4	0.6	1.1	-
	Total	4.0	0.6	-0.5	-

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969

Work on coordinated milk marketing will be completed and these resources shifted to an evaluation of the potentials for establishing record keeping and production management cooperatives. Work will be initiated on a study of cooperative dairy pooling policies and practices.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Information should be developed to assist farmers to maintain control through their cooperatives of their products at additional decision-making levels in production, distribution, marketing, and processing. (AAP) Studies are needed on the costs and benefits of -- consolidation of operations of present cooperatives. (EC) Highest priority should be given to studies which should lead to mergers...(MR)

Action -- Four studies were made to determine the feasibility of unifying marketing operations of dairy cooperatives. One study estimated benefits for alternative systems of combining milk bottling and processing operations of a group of cooperatives serving a relatively wide area. Two studies examined benefits farmers could gain by combining their fluid milk bargaining activities and their surplus milk handling operations. Another study explored benefits of combining dairy cooperatives in an area to permit consolidation of local creameries; milk drying plants and fluid processing and distributing operations.

Action -- A study was initiated to appraise the potential for cooperative cattle feedlots in the Southeast.

Action -- Work was started to determine the scope and potential of livestock marketing cooperatives. The initial phase focuses on the Southeast but work is planned for all other areas of the Nation.

Determine geographic areas that offer greatest potential economic gains from coordinated marketing. (AAP, MR)

Action -- Work is underway on the potential gains from coordinated marketing of dairy products in various geographic areas.

Need cooperative marketing and farm supply structures and organizations to serve large areas to increase efficiency and balance supplies interregionally. (AAP)

Action -- None.

Research is needed to determine most efficient combinations of cooperative marketing services and products for poultry producers.

Action -- None.

Research is needed on various pooling and other grower payment methods (EC)... to assist cooperatives formulate pooling systems to equitably distribute proceeds. (AAP) Pooling needs more research before this technique is applied to additional commodities. (MR)

Action -- A study was made of the feasibility of pooling veal calves at selected cooperative auctions. Another study is underway to evaluate the principles and methods used by dairy cooperatives in pooling marketing costs and sales returns.

4. New and Additional Research of Highest Priority

Potentials of Integration. Information should be developed as an assist to farmers in appraising and developing feasible programs that will enable them through their own cooperatives to maintain control of their products at additional decision-making levels in production, distribution, marketing, and slaughter processing. These studies should determine costs and benefits in relation to changes in marketing structure.

Cooperative Structure and Organization. There is a need for cooperatives to serve larger areas. In this way they can achieve greater operating efficiencies and where production increases more rapidly in one area than in others they can help balance surplus and short supplies to interregional market needs.

Combinations of Cooperative Service. Research is needed to determine the most efficient combinations of cooperative marketing services and products for poultry producers based on market requirements. This research could help farm families and cooperatives schedule farm production, farm resources, and credit through cooperative management centers more effectively.

EVALUATING THE PERFORMANCE OF A CHANGING MARKETING SYSTEM
Marketing Economics Division, ERS

1. Program Changes in Fiscal Year 1968

Activity (Research problem area 505)	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Marketing economics				
Dairy marketing	7.5	0.5	-0.9	-0.3
Livestock and meat marketing	11.8	0.5	-2.7	+0.5
Poultry and egg marketing	13.0	1.5	-0.9	-1.0
Total	32.3	2.5	-4.5	-0.8

2. Plans for Changes in Use of Current Resources through Fiscal Year 1968

No major shifts are contemplated, except normal shifting as projects are closed out and new ones started.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

The Livestock Marketing System

There is need to evaluate the present system in two important areas: (1) The effectiveness and cost of such a system to livestock producers in the industry and (2) the effectiveness of price-making under such a decentralized, diverse, and multiple system. (AAP)

Action -- A study of procurement and marketing practices of the cattle feeding industry in Texas-Oklahoma, Western Corn Belt, Colorado and California was initiated. The first results will be published during 1968. Southern and Western regional research projects in which ERS cooperates are analyzing the optimum location of feedlots, marketing centers and processing facilities for cattle. An analysis of the communication process in the livestock marketing system has been completed and will be published soon. Further work is planned in this area.

Formula Pricing

Formula pricing appears to be on the increase both in meats and livestock. Research is needed to appraise the effect of the increased use of formula pricing on the base prices used in the "Yellow Sheet" for meats and on prices of livestock in terminal markets.

Action -- None.

Transportation

Transportation and the distribution of live animals and meat products is an important part of the marketing process. A study should be made to determine the costs and effectiveness of the present patterns and problems of transportation and distribution of live animals and meat products.

Action -- None.

Trade Barriers in the Dairy Industry

The National Commission on Food Marketing and others have recommended study of the costs of overlapping health jurisdictions and impediments to the movement of milk both in bulk and packaged form. This study would determine the extent and cost of such duplicate inspections and other regulations.

Action -- This study has been initiated.

Market Potential for Dry Whole Milk

Because of recent technical improvements in drying whole milk, a marketing assessment of the potential for instant beverage quality dry whole milk is needed.

Action -- The study will get underway shortly.

Integration in the Poultry Industry

Vertical integration is spreading in the egg and turkey industries, following past developments in the broiler industry. Basic studies are needed to determine how these producing, input-supplying and marketing functions can be fitted together most efficiently and where the various units should be located in a given supply and distribution area.

Action -- Work now being completed on costs and economies of scale in feedmilling will complete sets of basic cost studies needed to fit together minimum cost combinations of production, input-supplying, and marketing functions. These combinations and the related locational aspects are being studied currently. A study of producer returns under various contracts for eggs, turkeys, and broilers was completed during the year.

Distribution of Lamb and Mutton.

The sheep industry has relied heavily on a study of distribution of lamb and mutton in the United States as it occurred in 1954. Due to the high level of mobility of the population and its expansion, it is reasonable to assume that consumption patterns for lamb and mutton have changed since the 1954 study. It is recommended that research be conducted to bring the above study up-to-date.

Action -- None due to lack of industry cooperation.

A study was initiated to analyze the location of both fed and feeder lamb production, the location of processors and distribution routes. Actual and optimal distribution patterns will be identified.

COMMODITY SITUATION AND OUTLOOK ANALYSIS
Economic and Statistical Analysis Division, ERS

1. Program Changes in Fiscal Year 1968.

Activity (Research problem area 506)	Scientist Man-Years (Estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mural
Livestock and Meat	4.5		-0.5	
Dairy	2.0			
Poultry and Eggs	1.0		+0.5	
Wool	1.5			
Total	9.0		0	

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969.

This area of work provides frequent appraisals of the economic prospects for important agricultural commodities. The publication of periodic situation reports containing the interpretation and analysis of statistical data furnishes a basis for making sound production and marketing decisions throughout the nation.

As more data become available from the 1965 Household Food Survey, analyses will be initiated on the changing patterns in demand for red meats, dairy products, and poultry and eggs. Increasing emphasis will be given on the cattle cycle, with particular attention given to changes in the inventory and production. A study of State and Federal Governments' economic regulation of fluid milk pricing and trade practices will be completed. In addition, a comprehensive dairy statistical series for 1960-67 will be completed and published. Preliminary analysis of dairy farm income in 1967 will be extended and completed when Census data become available.

3. 1966/67 Advisory Committee Recommendations and Extent of Implementation.

Forecasting Models for Livestock and Meat and Wool, (AAP) (EC)

Action--A review of previous work done in this area has been undertaken. Alternative methods of estimating annual and quarterly cattle slaughter and beef production are being revised and updated. A model for forecasting hog slaughter and prices is nearing completion. Seasonal adjustment factors for wool consumption have been revised, and an appraisal has been made of wool's share of total fiber use.

A comprehensive evaluation of institutional conditions in the fluid milk industry is needed periodically, (AAP)

Action--A study of the role of State and Federal governments in fluid milk pricing and in regulation of trade practices has been started. Investigation will include a survey of State agencies concerned with these kinds of regulations, study of State laws and examination of the Federal milk marketing order program.

Increasing specialization and large investment in specialized dairy equipment require greater emphasis on outlook for intermediate and longer term periods. (AAP) (EC)

Action--A preliminary set of projections for milk production and utilization have been made through 1972 and

for 1980 to afford improved planning information for the dairy industry.

4. New or Additional Research Needs of Highest Priority.

Supply-Demand Relationships for Poultry. The changes which have occurred in technology, organization, structure and practices in poultry and egg industry have altered the relationship of the industry to food retailers. These changes have progressed to such an extent that establishing live prices for broilers and to some extent turkeys is becoming increasingly difficult. New analyses are needed of the factors affecting supply and demand based on wholesale prices for ready-to-cook broilers, to replace older studies using farm prices for live broilers. Similar analyses are needed for turkey using wholesale ready-to-cook prices instead of farm prices for turkeys.

Study of Program Outlets for Dairy Products. CCC purchased and accumulated substantial quantities of butter in 1967 and is expected to continue substantial purchasing in 1968. Quantities of butter and nonfat dry milk in CCC hands, are more than are needed for domestic programs. However, problems exist in expanding foreign program outlets for U.S. dairy products. Foreign supplies of butter are above normal; vegetable oils are being used in donation programs which formerly utilized butter and butteroil; and CSM--a corn, soybean, milk blend--has been developed as a high protein food for foreign programs. Therefore, less nonfat dry milk is necessary for foreign feeding programs than formerly. Since, under current world conditions, the United States can expect very limited commercial dairy exports, analysis of alternative program opportunities for dairy exports would be particularly timely.

SUPPLY, DEMAND AND PRICE OF AGRICULTURE COMMODITIES
Economic and Statistical Analysis Division, ERS

1. Program Changes in Fiscal Year 1968.

Activity (Research problem area 506)	Scientist Man-Years (estimated)			
	F.Y. 1967 Base		Changes in F.Y. 1968	
	Intra-mural	Extra-mural	Intra-mural	Extra-mmural
Livestock and Meat	2.0			
Dairy	0.5		+0.5	
Poultry and Eggs	0		+0.5	
Wool	0			
Total	2.5		+1.0	

2. Plans for Changes in Use of Current Resources Through Fiscal Year 1969.

This area of work is devoted to studying the interrelationship among prices, production and consumption of farm products. It is useful for strengthening situation and outlook work and for appraising existing and alternative programs or policies pertaining to agricultural products.

On completion of the study on the cyclical nature of hog production and prices increasing emphasis will be placed on analysis of the demand for meat and poultry. Research will be initiated to identify the factors affecting the demand for milk and dairy products when the study on milk supply responses is completed. Analyses of changing supply-price behavior for eggs and broilers will be initiated.

3. 1966/67 Advisory Committee Recommendations and Extent of Implementation.

Economic Factors Affecting the Feed-Livestock Economy (AAP) (EC)

Action--A study was initiated on the relationship between livestock numbers in terms of grain-consuming

total livestock products produced and the total tonnage of feed grains and other concentrate fed to livestock. These relationships were developed on a semiannual basis to improve the estimates of feed consumption during the year.

Competition Between Wool and Non-Cellulosic Fibers

Action--Data have been assembled on world apparel wool production, prices and other factors which affect the demand of raw fiber.

Supply Resources of Intensified Sheep Production

Action--None, because of limited resources.

4. New or Additional Research Needs of Highest Priority.

Changing Patterns in Demand for Meat. Important shifts have been occurring in the demand for meat and poultry products in the past decade. The shifts that have been taking place for the individual meats are related, and a thorough analysis is needed to determine the extent to which these shifts have added to the total demand for meat. A comprehensive analysis is needed which will combine analyses using data from the 1965/66 Household Food Consumption Survey with analyses using historical data to trace out changing demand patterns and to forecast probable future changes.

Factors Affecting the Demand for Milk and Dairy Products. Domestic consumption patterns of milk and many dairy products have undergone substantial changes since the last comprehensive study of demand for dairy products was made in the mid-1950's. This is exemplified by the downtrend in milk consumption and declines in commercial sales of milk and many dairy products despite rising consumer incomes. The development of more substitute

non-dairy products and filled milk products and competition from other foods suggest that consumption of dairy items may have become more sensitive to price and other factors than formerly.

CONSUMER ATTITUDES AND PREFERENCES
Special Surveys Branch, SRS

1. Program Changes in Fiscal Year 1968

Problem Area No.	Title and Activity	Scientist Man-Years (Estimated) F.Y. 1967 Base Intramural	F.Y. 1967 Base Extramural	Changes in F.Y. 1968 Intramural	Changes in F.Y. 1968 Extramural
508	Development of domestic market for farm products				
	Dairy	0.7	0.2		- 0.2
	Livestock	0.7	1.5		
	Wool	0.2			
	Total	1.6	1.7 1/		- 0.2

1/ Includes funds from ARS and industry groups.

2. Plans for Changes in Use of Current Resources through F.Y. 1969

Again this year the total effort expended on consumer attitudes and preferences will be increased somewhat because Statistical Reporting Service funds have been augmented by funds provided by the Agricultural Research Service, the National Live Stock and Meat Board, and the Florida Citrus Commission. The emphasis on specific end-products among the various commodities will shift as studies currently underway are finished and resources can be applied to other problem areas. Lines of work underway include the following: consumer knowledge, experiences, preferences, and opinions regarding the relative advantages and disadvantages of shoes and clothing made of leather in comparison with synthetic substitutes; consumers' use of and opinions about meats, with emphasis on pork and beef; and small group experiments on consumers' reactions to a number of agricultural products to evaluate product improvement efforts by producer organizations or the Department's utilization laboratories. The consumer survey phase of the small-scale market test of a dry whole milk developed by Agricultural Research Service will be conducted in cooperation with the Economic Research Service. Additional research on homemakers' reactions to the idea of relatively new methods currently being employed or considered in the processing of foods, such as irradiation and freeze-drying, is also tentatively scheduled. If, as planning progresses on these studies, it appears advisable to postpone or cancel any of them, other studies recommended by the research advisory committees will be considered for activation. The actual number of new studies undertaken will depend on the size and scope of the particular problems selected for study. The exact choice of projects cannot be made this far in advance since to a large extent decisions will depend upon the relative urgency of problems as they appear at that time.

3. 1966-67 Advisory Committee Recommendations and Extent of Implementation

Special priority should be given to assessing consumer attitudes toward foods processed by radiation methods. (AAP)

Action -- Tentatively scheduled for initiation as noted above.

It is requested that a study be initiated to relate consumer taste preference in milk to the utilization of different feed rations containing various alfalfa types in the production of milk. (GF)

Action -- Some sensory evaluation tests on products made from soybeans have been conducted. A study to relate consumer taste preference in milk to the use of feed rations containing various alfalfa types in the production of milk had been scheduled during 1967 but it turned out that the necessary alfalfa types were not available in sufficient quantity at that time. We intend to reschedule this research when convenient for the cooperator.

Sensory evaluation research should be expanded on consumer discrimination and preferences for dairy products. (AAP)

Action -- Some research on dairy products is scheduled; additional work can be undertaken in this area as specific requests are received.

Research should be expanded on the opinions and preferences of consumers concerning new products through the placement in households, for use under more natural conditions than a laboratory provides, of various items such as dairy foods as they approach commercial introduction. (AAP)

Action -- This research continues at the same level. No new household placement studies for dairy products have been planned.

Consumer preference research on cotton, wool, and competing materials should be expanded. (AAP and CO)

Action -- Although the research program has not been expanded, a new study on cotton is tentatively scheduled; no studies are planned which focus directly on wool. However, research undertaken on cotton frequently provides some information about wool in those specific end products where both fibers are used.

Research should be conducted to provide up-to-date information about the opinions of consumers concerning the adequacy of response by the retail food industry to consumer needs and demands.

Action -- Research has not been initiated concentrating solely on this area; portions of some of the commodity-oriented studies undertaken or planned provide some helpful information.

The committee favors continuing the studies on consumer attitudes and preferences and the program now being considered for initiation. (EC)

Action -- Research on consumer attitudes continues at about the same level. Selection of all of the new projects already initiated or planned for the current year has been guided by the recommendations of this committee and the other advisory committees.

4. New or Additional Research Needs of Highest Priority

Consumer Preference for Cotton and Wool Products. Manmade fibers and blends have moved aggressively into the textile market and provided sharp competition for the natural fibers, making the need for sound information on consumer reactions on a nationwide basis even more urgent. Consumer preference research on cotton, wool, and competing materials should be expanded to provide this information. Studies which should be given high priority include consumers' opinions of and preferences for cotton, wool, and competing materials in men's wear, children's wear, and household products.

Consumer Reactions to Various Food Products under Laboratory Conditions. With new food products appearing in increasing numbers, research should be expanded in the area of consumer food products differing in quality or flavor factors. This research is conducted through experiments in the sensory evaluation laboratory on such products as citrus juices in canned, concentrated or powdered form, other fruit juice products such as pineapple concentrate or punches blending more than one fruit flavor, etc. These small-scale studies conducted under controlled conditions give direction to later household placement tests, aid industry in planning efforts for more effective marketing, provide an evaluation of possible consumer acceptance of new developments or variations, and provide insights into the effectiveness of scientific research designed to develop agricultural products with greater appeal and usefulness to consumers.

Consumer Reactions to Test Products used in the Home. To assist in the initial efforts to market new and improved food products of agricultural origin most effectively, industry needs to know homemakers' reactions to such innovations. Research should be expanded on the opinions and preferences of consumers concerning new products through the placement in households, for use under more natural conditions than a laboratory provides, of various items such as fruit juices, and other food products as they approach commercial introduction. In addition to providing industry and the laboratories with information about any previously unknown or suspected shortcomings of new products (such as difficulty in reconstitution or in following reconstitution instructions), household placement tests which indicate better-than-average acceptance of a given product provide added inducement to a potential processor, and others in the marketing channels, to introduce the line.

Consumer Reactions to Selected Dairy Products. The recent proliferation of imitation dairy products presents dairy farmers with a need for additional information concerning household consumers' opinions about selected dairy items in relation to synthetic competitors. Such information would provide direction to product improvement research on dairy products with greater appeal to consumers, as well as to educational and promotional programs designed to expand the domestic market for these products.